Public Input No. 2426-NFPA 70-2023 [Global Input]

See Attached File - Which Includes multiple related changes, all under the purview of CMP 10.

Additional Proposed Changes

File Name	Description	Approved
PIs_For_CMP_10_Voltage_Demarcation_.docx	Global PI for CMP 10 (Consistent Voltage Demarcation)	

Statement of Problem and Substantiation for Public Input

This Public Input is submitted on behalf of a Correlating Committee Task Group consisting of Robert Osborne (Chair), Paul Barnhart, Lou Grahor, Donny Cook, Scott Higgins, Mike Querry, Roger McDaniel, Dave Burns, Rod Belisle, Kevin Rogers, Tony Ricciuti, Paul Knapp, Paul Sullivan, George Smith, Eric Simmon, Kevin Arnold, Larry Wildermuth, and Kyle Krueger.

Changes related to the voltage demarcation have been grouped to assist the CMP with review and resolution, with each change, and it's corresponding substantiation, noted in the table below: (table provided in attachment)

Submitter Information Verification

Submitter Full Name: Robert Osborne
Organization: UL Solutions
Street Address:
City:
State:
Zip:

Submittal Date: Thu Aug 17 09:38:06 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-8927-NFPA 70-2024

Statement: Duplicate language regarding circuits 1000 volts ac and 1500 volts dc found in Articles were removed since the scope of each Article explains the voltages that are applicable.

This Public Input is submitted on behalf of a Correlating Committee Task Group consisting of Robert Osborne (Chair), Paul Barnhart, Lou Grahor, Donny Cook, Scott Higgins, Mike Querry, Roger McDaniel, Dave Burns, Rod Belisle, Kevin Rogers, Tony Ricciuti, Paul Knapp, Paul Sullivan, George Smith, Eric Simmon, Kevin Arnold, Larry Wildermuth, and Kyle Krueger.

Changes related to the voltage demarcation have been grouped to assist the CMP with review and resolution, with each change, and it's corresponding substantiation, noted in the table below:

Reference	**Suggested Revision**	**Substantiation**
Article 215	**Feeders <u>Not Over 1000 Volts ac, 1500 Volts dc, Nominal</u>**	The title of the Article is revised to align with the Scope.
Article 225	**Outside Branch Circuits and Feeders <u>Not Over 1000 Volts ac, 1500 Volts dc, Nominal</u>**	The title of the Article is revised to align with the Scope.
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:	With the identification in the title and scope of the Article that the requirements apply to certain voltage ranges, the inclusion of this detail in this section is unnecessary.
225.18	**Clearance for Overhead Conductors and Cables.** … cables ~~of not over 1000 volts, nominal,~~ shall have a clearance of not less than the following:	With the identification in the title and scope of the Article that the requirements apply to certain voltage ranges, the inclusion of this detail in this section is unnecessary.
225.19	**Clearances from Buildings ~~for Conductors of Not over 1000 Volts, Nominal.~~**	With the identification in the title and scope of the Article that the requirements apply to certain voltage ranges, the inclusion of this detail in this section is unnecessary.
225.30(D)	**Capacity Requirements.** Additional feeders or branch circuits shall be permitted where the capacity requirements are in excess of 2000 amperes ~~at a supply voltage of 1000 volts or less~~.	With the identification in the title and scope of the Article that the requirements apply to certain voltage ranges, the inclusion of this detail in this section is unnecessary.
230	**Services <u>Not Over 1000 Volts ac, 1500 Volts dc, Nominal</u>**	The title of the Article is revised to align with the Scope
230.24	Clearances. Overhead service conductors shall not be readily accessible and shall comply with 230.24(A) through (E) ~~for services not over 1000 volts, nominal~~.	With the identification in the title and scope of the Article that the requirements apply to certain voltage ranges, the inclusion of this detail in this section is unnecessary.
230.24(B)	**Vertical Clearance for Overhead Service Conductors.** Overhead service conductors~~, where not in excess of 1000 volts, nominal,~~ shall have the following …	With the identification in the title and scope of the Article that the requirements apply to certain voltage ranges, the inclusion of this detail in this section is unnecessary.
230.43	Wiring Methods ~~for 1000 Volts, Nominal, or Less~~	With the identification in the title and scope of the Article that the requirements apply to certain voltage ranges, the inclusion of this detail in this section is unnecessary.
230.66(A)	**General.** Service equipment ~~rated at 1000 volts or less~~ shall be marked to identify it as being suitable for use as service equipment. All service equipment shall be listed or field evaluated.	With the identification in the title and scope of the Article that the requirements apply to certain voltage ranges, the inclusion of this detail in this section is unnecessary.
230.82	(2) Meters and meter sockets ~~nominally rated not in excess of 1000 volts~~, if all metal … (3) Meter disconnect switches ~~nominally rated not in excess of 1000 volts~~ that have a short-circuit current rating …	With the identification in the title and scope of the Article that the requirements apply to certain voltage ranges, the inclusion of this detail in this section is unnecessary.
Article	Overcurrent Protection <u>for Systems Not Over 1000 Volts ac, 1500 Volts</u>	Title of the Article is updated to align with the title

<table>
<tr><td>240</td><td>dc, Nominal</td><td>of Article 245.</td></tr>
<tr><td>240.1</td><td>Parts I through VII of this article provide the general requirements for overcurrent protection and overcurrent protective devices not over ~~more than~~ 1000 volts ac, 1500 volts dc, nominal. Part VIII covers overcurrent protection for those portions of supervised industrial installations operating at voltages of not over ~~more than~~ 1000 volts ac, 1500 volts dc, nominal.</td><td>The scope of the Article is updated to align with the scope of Article 245.</td></tr>
<tr><td>240.61</td><td>Classification.
Cartridge fuses and fuseholders shall be classified according to voltage and amperage ranges. Fuses ~~rated 1000 volts, nominal, or less~~ shall be permitted to be used for voltages at or below their ratings.</td><td>With the identification in the title and scope of the Article that the requirements apply to certain voltage ranges, the inclusion of this detail in this section is unnecessary.</td></tr>
<tr><td>240.83(B)</td><td>Location.
Circuit breakers rated at 100 amperes or less ~~and 1000 volts or less~~ shall have the ampere rating molded, stamped, etched, or similarly marked into their handles or escutcheon areas.</td><td>With the identification in the title and scope of the Article that the requirements apply to certain voltage ranges, the inclusion of this detail in this section is unnecessary.</td></tr>
<tr><td>242.1</td><td>Scope.
… Part II covers surge-protective devices (SPDs) permanently installed on premises wiring systems of not ~~more than~~ over 1000 volts ac, 1500 volts dc, nominal, while Part III covers surge arresters permanently installed on premises wiring systems over 1000 volts, nominal.</td><td>The Standard for Surge Protective Devices, UL 1449, covers SPD’s rated not over 1000 volts ac, 1500 volt dc. This revision aligns with other changes to the NEC and is in line with the corresponding product standard.</td></tr>
<tr><td>242 Part II</td><td>Part II. Surge-Protective Devices (SPDs), Not Over 1000 Volts ac, 1500 Volts dc, Nominal ~~or Less~~.</td><td>The Standard for Surge Protective Devices, UL 1449, covers SPD’s rated not over 1000 volts ac, 1500 volt dc. This revision aligns with other changes to the NEC and is in line with the corresponding product standard.</td></tr>
<tr><td>242.12</td><td>Uses Not Permitted.
An SPD device shall not be installed in the following:
(1) Circuits over 1000 volts ac, 1500 volts dc, nominal</td><td>The Standard for Surge Protective Devices, UL 1449, covers SPD’s rated not over 1000 volts ac, 1500 volt dc. This revision aligns with other changes to the NEC and is in line with the corresponding product standard.</td></tr>
<tr><td>408.1</td><td>Scope.
It does not apply to equipment operating at over 1000 volts ac, 1500 volts dc, nominal, except as specifically referenced elsewhere in the Code.</td><td>Requirements are revised to include the same voltage demarcation used in many places throughout the Code.</td></tr>
<tr><td>Table 408.56</td><td>Table 408.56
Table 408.56 Minimum Spacings Between Bare Metal Parts
<table>
<tr><th rowspan="2">AC or DC Voltage</th><th colspan="2">Opposite Polarity Where Mounted on the Same Surface</th><th colspan="2">Opposite Polarity Where Held Free in Air</th><th colspan="2">Live Parts to Ground*</th></tr>
<tr><th>mm</th><th>in.</th><th>mm</th><th>in.</th><th>mm</th><th>in.</th></tr>
<tr><td>Not over 125 volts, nominal</td><td>19.1</td><td>3⁄4</td><td>12.7</td><td>1⁄2</td><td>12.7</td><td>1⁄2</td></tr>
<tr><td>Not over 250 volts, nominal</td><td>31.8</td><td>11⁄4</td><td>19.1</td><td>3⁄4</td><td>12.7</td><td>1⁄2</td></tr>
<tr><td>Not over 1000 volts ac, 1500 volts dc, nominal</td><td>50.8</td><td>2</td><td>25.4</td><td>1</td><td>25.4</td><td>1</td></tr>
<tr><td colspan="7">*For spacing between live parts and doors of cabinets, the dimensions in 312.101(A) shall apply.</td></tr>
</table></td><td>The Standard for Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures, UL 489, is an important document in the area of power distribution products for the US. This standard covers overcurrent devices in common use in NEC applications. The scope of the standard covers breakers rated not over 1000 volts ac, 1500 volts dc. Included in the standard is a spacings table that the Technical Committee for UL 489 modified in recent years to add spacings for the ranges above 600 volts, up to and including 1000 Vac, 1500 Vdc. Spacings (as covered in Table 6.1.6.1.1 of that Standard) establish the limits for 1500 Vdc to be the same as for 1000 Vac. This public input, using this concept from the product standard, revises the requirement to include installations at voltages up to 1500 Vdc.</td></tr>
</table>

Public Input No. 4050-NFPA 70-2023 [Global Input]

Review the terms regarding overcurrent protection and determine if the correct term is being used.

(1) Branch-Circuit Overcurrent Protective Device

(2) Current-Limiting Overcurrent Protective Device

(3) Current-Limiting

(4) Current-Limiting Overcurrent

(5) Overcurrent Protection

(6) Overcurrent Protection Device

(7) Overcurrent Protective Device

(8) Supplementary Overcurrent Protective Device

(9) Supplementary Overcurrent Protection

Statement of Problem and Substantiation for Public Input

The defined terms regarding overcurrent protection need to be reviewed by all code making panels and determine if the correct term is being used. The code has too many terms regarding overcurent protection, some that are defined and some that are not defined. These terms are often used interchangeably in the wrong context.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:

Submittal Date: Wed Sep 06 14:59:12 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: A task group is going to be created to review overcurrent protection terminology. The terms and their uses need to be consistent throughout the Code.

Public Input No. 914-NFPA 70-2023 [New Article after 100]

Grouped Overcurrent Protection Devices and Disconnects

Overcurrent devices and disconnects installed in the same enclosure, or adjacent to each other in separate enclosures, fed from the same source.

Additional Proposed Changes

File Name	Description	Approved
NEC_2026_PI_-_Art_100_Definitions.docx	PI Form	

Statement of Problem and Substantiation for Public Input

Art 240.21(C)(3) Industrial Installation Secondary Conductors Not over 7.5 m (25 ft) Long. Requires overcurrent devices to be grouped. There is no definition for grouped overcurrent protection devices, just for conductors.
Art 230.40 Exception No. 2: Where two to six service disconnecting means in separate enclosures are grouped at one location and supply separate loads from one service drop, set of overhead service conductors, set of underground service conductors, or service lateral, one set of service-entrance conductors shall be permitted to supply each or several such service equipment enclosures.
Table 450.3(A) Maximum Rating or Setting of Overcurrent Protection for Transformers Over 1000 Volts (as a Percentage of Transformer-Rated Current) Footnote 2 - 2Where secondary overcurrent protection is required, the secondary overcurrent device shall be permitted to consist of not more than six circuit breakers or six sets of fuses grouped in one location. Where multiple overcurrent devices are utilized, the total of all the device ratings shall not exceed the allowed value of a single overcurrent device. If both circuit breakers and fuses are used as the overcurrent device, the total of the device ratings shall not exceed that allowed for fuses.
Table 450.3(B) Footnote 2 - Where secondary overcurrent protection is required, the secondary overcurrent device shall be permitted to consist of not more than six circuit breakers or six sets of fuses grouped in one location. Where multiple overcurrent devices are utilized, the total of all the device ratings shall not exceed the allowed value of a single overcurrent device.

The referenced articles require grouped overcurrent protection devices or disconnects. The definition grouped in Art 100 refers to conductors / cables only, not addressing grouped disconnects or overcurrent protection devices. The word grouped.

Per Oxford Definition – Group - a number of people or things that are located close together or are considered or classed together.
The word grouped is not defined and leaves room for interpretation. It does not define if all OCPD have to be in one enclosure or different enclosures. When non-fused UL98 listed safety switches are used, they cannot be grouped in one enclosure. They may lead to the assumption that overcurrent protection devices need to be in their own, individual enclosure.

To define the word grouped for overcurrent protection devices and disconnects takes away any potential gray area for a wrongful assumption or overspending on purchasing individual disconnects only.

Submitter Information Verification

Submitter Full Name: Mark Pisani
Organization: Basf Corporation
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jun 01 11:56:01 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The proposed definition is not necessary. The standard dictionary definition of “grouped” is sufficient to clarify that the devices need to be located close together.

NFPA Public Input Form

NOTE: All Public Input must be received by 5:00 pm EST/EDST on the published Public Input Closing Date.

For further information on the standards-making process, please contact the Codes and Standards Administration at 617-984-7249 or visit www.nfpa.org/codes.

For technical assistance, please call NFPA at 1-800-344-3555

FOR OFFICE USE ONLY

Log #:

Date Rec'd:

Date **Name** Mark K Pisani **Tel. No.**

Company BASF **Email**

Street Address **City** **State** **Zip**

Please indicate organization represented (if any)

1. (a) Title of NFPA Standard National Electrical Code **NFPA No. & Year** 70-2026

(b) Section/Paragraph 100

2. Public Input Recommends (check one): ☒ new text ☐ revised text ☐ deleted text

3. Proposed Text of Public Input (include proposed new or revised wording, or identification of wording to be deleted): [Note: Proposed text should be in legislative format; i.e., use underscore to denote wording to be inserted (<u>inserted wording</u>) and strike-through to denote wording to be deleted (~~deleted wording~~).]

<u>**Grouped Overcurrent Protection Devices and Disconnects**</u>

<u>Overcurrent devices and disconnects installed in the same enclosure, or adjacent to each other in separate enclosures, fed from the same source.</u>

4. Statement of Problem and Substantiation for Public Input: (Note: State the problem that would be resolved by your recommendation; give the specific reason for your Public Input, including copies of tests, research papers, fire experience, etc. If more than 200 words, it may be abstracted for publication.)

*Art 240.21(C)(3) Industrial Installation Secondary Conductors Not over 7.5 m (25 ft) Long. Requires overcurrent devices to be grouped. There is no definition for **grouped** overcurrent protection devices, just for conductors.*
*Art 230.40 Exception No. 2: Where two to six service disconnecting means in separate enclosures are **grouped** at one location and supply separate loads from one service drop, set of overhead service conductors, set of underground service conductors, or service lateral, one set of service-entrance conductors shall be permitted to supply each or several such service equipment enclosures.*
*Table 450.3(A) Maximum Rating or Setting of Overcurrent Protection for Transformers Over 1000 Volts (as a Percentage of Transformer-Rated Current) Footnote 2 - 2Where secondary overcurrent protection is required, the secondary overcurrent device shall be permitted to consist of not more than six circuit breakers or six sets of fuses **grouped** in one location. Where multiple overcurrent devices are utilized, the total of all the device ratings shall not exceed the allowed value of a single overcurrent device. If both circuit breakers and fuses are used as the overcurrent device, the total of the device ratings shall not exceed that allowed for fuses.*
*Table 450.3(B) Footnote 2 - Where secondary overcurrent protection is required, the secondary overcurrent device shall be permitted to consist of not more than six circuit breakers or six sets of fuses **grouped** in one location. Where multiple overcurrent devices are utilized, the total of all the device ratings shall not exceed the allowed value of a single overcurrent device.*

The referenced articles require grouped overcurrent protection devices or disconnects. The definition grouped in Art 100 refers to conductors / cables only, not addressing grouped disconnects or overcurrent protection devices. The word grouped.

Per Oxford Definition – Group - a number of people or things that are located close together or are considered or classed together.

The word grouped is not defined and leaves room for interpretation. It does not define if all OCPD have to be in one enclosure or different enclosures. When non-fused UL98 listed safety switches are used, they cannot be grouped in one enclosure. They may lead to the assumption that overcurrent protection devices need to be in their own, individual enclosure.

To define the word grouped for overcurrent protection devices and disconnects takes away any potential gray area for a wrongful assumption or overspending on purchasing individual disconnects only.

5. Copyright Assignment

(a) ☒ **I am the author of the text or other material (such as illustrations, graphs) proposed in the Public Input.**

(b) ☐ **Some or all of the text or other material proposed in this Public Input was not authored by me. Its source is as follows:** (please identify which material and provide complete information on its source)

Signature (Required) ______________________

PLEASE USE SEPARATE FORM FOR EACH PUBLIC INPUT

To: Secretary, Standards Council National Fire Protection Association
1 Batterymarch Park · Quincy, MA 02169-7471 OR
Fax to: (617) 770-3500 OR Email to: proposals_comments@nfpa.org

9/11/2023

Public Input No. 745-NFPA 70-2023 [Definition: Feeder.]

Feeder.

All circuit conductors between the service equipment, the source of a separately derived system, or other power supply source and the final branch-circuit ~~overcurrent~~ overcurrent protective device. (CMP-10)

Statement of Problem and Substantiation for Public Input

This is just proposing that we use the defined term branch-circuit overcurrent protective device in the definition of feeder for clarity, here. There is no reason to use a new term that isn't defined when there is already a defined term.

Submitter Information Verification

Submitter Full Name: Richard Holub
Organization: The DuPont Company, Inc.
Street Address:
City:
State:
Zip:

Submittal Date: Wed Apr 26 13:57:42 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-8851-NFPA 70-2024

Statement: The definition of feeder has been modified to align with the defined term branch-circuit overcurrent protective device.

Public Input No. 730-NFPA 70-2023 [Definition: Fuse, Nonvented Power. (Nonvented Power Fuse)]

Fuse, ~~Nonvented~~ Unvented Power. (~~Nonvented~~ Unvented Power Fuse)

A fuse without intentional provision for the escape of arc gases, liquids, or solid particles to the atmosphere during circuit interruption. (CMP-10)

Statement of Problem and Substantiation for Public Input

"Nonvented" is not found in any dictionary of any variant of English, so the word does not exist. However, "unvented" is found in many English dictionaries and is commonly used.

Submitter Information Verification

Submitter Full Name: Conrad Ko
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Apr 26 01:11:09 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The term “nonvented” currently used in the definition aligns with industry standards and the practices of fuse manufacturers. The proposed changes may cause confusion.

Public Input No. 59-NFPA 70-2023 [Definition: Industrial Installation, Supervised. (Supervise...]

Industrial Installation, Supervised. (Supervised Industrial Installation)

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~~ robots 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)

Statement of Problem and Substantiation for Public Input

We should be restricting the loosening of safety rules to only those installations controlled by robots.

Submitter Information Verification

Submitter Full Name: John Doe
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jan 06 22:39:43 EST 2023
Committee: NEC-P10

Committee Statement

Resolution: The proposed PI lacks technical substantiation. In addition, the NEC does not contain any requirements related to “robots.” The proposed changes to the definition do not ensure the safety of a system.

Public Input No. 991-NFPA 70-2023 [Definition: Industrial Installation, Supervised. (Supervise...]

Industrial Installation, Supervised. (Supervised Industrial Installation)

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~~ this code .

(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)

Statement of Problem and Substantiation for Public Input

Section 4.1. of the NEC(r) Style Manual prohibits referencing an entire article, except Article 100 or where required for context. As such, I've proposed a simple revision here to comply with the code. The index or the table of contents will easily lead the user to the load calculations article.

Submitter Information Verification

Submitter Full Name: Richard Holub
Organization: The DuPont Company, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jun 08 12:50:05 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-8853-NFPA 70-2024

Statement: Per the NEC Style Manual section 4.1.4, referencing a full article is not permitted. The definition has been revised to comply with the Style Manual.

Public Input No. 2223-NFPA 70-2023 [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. (CMP-10)

Statement of Problem and Substantiation for Public Input

The definition itself states “a device capable of providing protection for service, feeder, and branch circuits and equipment” therefore removing “Branch-Circuit” from this definition makes it apply to what the definition says and not just branch circuits. The proposed revisions will enhance usability and bring clarity to Code users.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 15 12:10:00 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The proposed changes do not add clarity or usability. The suggested changes could have unintended consequences elsewhere with product standards.

Public Input No. 3036-NFPA 70-2023 [Definition: Overcurrent Protective Device, Branch-Circuit. ...]

Overcurrent ~~Protective Device, Branch-Circuit~~ Protection Device (OCPD), . (~~Branch-Circuit~~ Overcurrent ~~Protective Device~~ Protection 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. (CMP-10)

Statement of Problem and Substantiation for Public Input

The term Overcurrent Protective Device, Branch-Circuit is only found in twelve sections of the code and only three sections in Article 240. The current term provides protection for services, feeders and branch circuits. The title of the term does not easily align with the definition. The correct term should be Overcurrent Protective Device that is used in over 80 sections in the document.
Overcurrent Protection is used 416 times and only 8 as Overcurrent Protection Device.
Overcurrent Protective 230 times 83% of those as Overcurrent Protective Device
Changing the term to Overcurrent Protection Device instead of Overcurrent Protective Device and using the term Overcurrent Protection through out the code will reduce confusion, provide consistency, clarity and increase usability.
The current definition is creates a confusion in the industry using the term "Branch Circuit" and than saying it is for services, feeders and branch circuits.
That may be a term that is part of a listing standard be but doesn't provide clarity to the NEC.
Adding the acronym that is commonly used in the industry will also provide a value to the users of the code.

Submitter Information Verification

Submitter Full Name:	David Williams
Organization:	Delta Charter Township
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Tue Aug 29 07:25:49 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: The proposed changes do not add clarity or usability. The suggested changes could have unintended consequences elsewhere with product standards.

Public Input No. 460-NFPA 70-2023 [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. (CMP-10)

Statement of Problem and Substantiation for Public Input

Branch circuit is a defined term. Its use within this definition conflicts with this definition. For example, how can "[t]he circuit conductors between the final overcurrent device protecting the circuit and the outlet(s)" (defined term branch circuit) be capable of being protected by the overcurrent protective device protecting services and feeders? The recommendation is to simply have this definition define "Overcurrent Protective Device." However, perhaps more accurately, consider having this definition define "Overcurrent Protective Device, Branch-Circuit, Feeder or Service. (Branch-Circuit, Feeder or Service Overcurrent Protective Device)"

Submitter Information Verification

Submitter Full Name: Palmer Hickman

Organization: Electrical Training Alliance

Street Address:

City:

State:

Zip:

Submittal Date: Wed Mar 15 09:28:30 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: The proposed changes do not add clarity or usability. The suggested changes could have unintended consequences elsewhere with product standards.

Public Input No. 461-NFPA 70-2023 [Definition: Overcurrent Protective Device, Branch-Circuit. ...]

Overcurrent Protective Device, Branch-Circuit, Feeder or Service . (Branch-Circuit ~~Overcurrent~~ , Feeder or Service 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. (CMP-10)

Statement of Problem and Substantiation for Public Input

Branch circuit is a defined term. Its use within this definition conflicts with this definition. For example, how can "[t]he circuit conductors between the final overcurrent device protecting the circuit and the outlet(s)" (defined term branch circuit) be capable of being protected by the overcurrent protective device protecting services and feeders? Revise this definition so that it defines "Overcurrent Protective Device, Branch-Circuit, Feeder or Service. (Branch-Circuit, Feeder or Service Overcurrent Protective Device)" since that is what it actually protects. I do not believe that this recommendation contains the term being defined as it is "a device" rather than being defined as "an overcurrent protective device."

Submitter Information Verification

Submitter Full Name: Palmer Hickman

Organization: Electrical Training Alliance

Street Address:

City:

State:

Zip:

Submittal Date: Wed Mar 15 09:45:29 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: The proposed changes do not add clarity or usability. The suggested changes could have unintended consequences elsewhere with product standards.

Public Input No. 780-NFPA 70-2023 [Definition: Overcurrent Protective Device, Branch-Circuit. ...]

Overcurrent Protective Device, ~~Branch-Circuit~~ Premises Wiring . (~~Branch~~ Premises -~~Circuit~~ ~~Overcurrent~~ Wiring 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. (CMP-10)

Statement of Problem and Substantiation for Public Input

Branch circuit is a defined term. The present title and definition applies to more that this defined term. An appropriate term would be the defined term "premises wiring" which would include branch, feeder and service circuit.

Submitter Information Verification

Submitter Full Name: Palmer Hickman
Organization: Electrical Training Alliance
Street Address:
City:
State:
Zip:
Submittal Date: Tue May 09 15:18:43 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The proposed changes do not add clarity or usability. The suggested changes could have unintended consequences elsewhere with product standards.

Public Input No. 790-NFPA 70-2023 [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~~ feeder and branch circuits and equipment over the full range of overcurrents between its rated current and its interrupting rating. (CMP-10)

Statement of Problem and Substantiation for Public Input

"Service" is removed as I do not believe that the device, as defined, provides protection for service circuits as the definition presently states. Perhaps such a device does provide protection to some service equipment. However, the definition states that the device provides protection to service circuits and equipment. Perhaps a separate definition that defines what a "service overcurrent protective device" is and what it protects would be in order rather that having it commingled with a device that protects feeder circuits and equipment and branch circuits and equipment. In fact, separate definitions that independently define protection for service circuits and equipment, feeder circuits and equipment, and branch circuits and equipment may be in order. Clarification and/or making this definition technically correct is the requested outcome.

Submitter Information Verification

Submitter Full Name: Palmer Hickman
Organization: Electrical Training Alliance
Street Address:
City:
State:
Zip:
Submittal Date: Wed May 10 10:52:11 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The proposed changes do not add clarity or usability. The suggested changes could have unintended consequences elsewhere with product standards.

Public Input No. 4040-NFPA 70-2023 [Definition: Overcurrent Protective Device, Current-Limiting...]

~~**Overcurrent Protective Device, Current-Limiting. (Current-Limiting Overcurrent Protective Device)**~~

~~A device that, when interrupting currents in its current-limiting range, reduces the current flowing in the faulted circuit to a magnitude substantially less than that obtainable in the same circuit if the device were replaced with a solid conductor having comparable impedance. (240) (CMP-10)~~

Statement of Problem and Substantiation for Public Input

Delete the term Overcurrent Protective Device, Current-Limiting.
The defined term only applies to Article 240, based on the parenthetical 240 at the end of the defined term. The term is not used in Article 240 and should be deleted. The term is only used in one section of the NEC, being section 706.31(D). Defining the term Current-limiting (as applied to overcurrent protection) would be more beneficial and more appropriately with purview CMP-10.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:

Submittal Date: Wed Sep 06 14:46:24 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-8857-NFPA 70-2024

Statement: The term “current-limiting overcurrent protective device” was revised to “current-limiting” as it is used throughout the Code in the same context without the “overcurrent protective device” portion. The application of the term in relation to overcurrent protection devices is now stated in a parenthetical. Additionally, the definition was revised editorially to be grammatically correct.

Public Input No. 4042-NFPA 70-2023 [Definition: Overcurrent Protective Device, Current-Limiting...]

~~Overcurrent Protective Device,~~ Current-Limiting. (~~Current-Limiting Overcurrent Protective Device)~~

~~A device that, when interrupting currents in its current-limiting range, reduces the current flowing in the faulted circuit to a magnitude substantially less than that obtainable in the same circuit if the device were replaced with a solid conductor having comparable impedance. (240) (~~

As applied to overcurrent protection)

The practice of imposing a limit on the current that may be delivered to a load to protect the circuit from harmful effects due to a short-circuit or overload. (CMP-10)

Statement of Problem and Substantiation for Public Input

The current defined term Overcurrent Protective Device, Current-Limiting only applies to Article 240, based on the parenthetical 240 at the end of the definition. The term is not used in Article 240 and should be deleted. The term is only used in section 706.31(D) in the code. Defining the term Current-limiting (as applied to overcurrent protection) would be more beneficial and more appropriately with CMP-10. This new term could be applicable to different applications of Current-Limiting.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:
Submittal Date: Wed Sep 06 14:50:54 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-8857-NFPA 70-2024

Statement: The term “current-limiting overcurrent protective device” was revised to “current-limiting” as it is used throughout the Code in the same context without the “overcurrent protective device” portion. The application of the term in relation to overcurrent protection devices is now stated in a parenthetical. Additionally, the definition was revised editorially to be grammatically correct.

Public Input No. 4273-NFPA 70-2023 [Definition: Overcurrent Protective Device, Current-Limiting...]

Overcurrent ~~Protective Device~~ Protection Device , Current-Limiting. (Current-Limiting Overcurrent ~~Protective Device~~ Protection Device)

A device that, when interrupting currents in its current-limiting range, reduces the current flowing in the faulted circuit to a magnitude substantially less than that obtainable in the same circuit if the device were replaced with a solid conductor having comparable impedance. (~~240) (~~ CMP-10)

Statement of Problem and Substantiation for Public Input

The defined term is changed to Overcurrent Protection Device, Current-Limiting and the reference to Article 240 is removed.
Changing from Protective to Protection will provide consistency within the document. The current term is not used in Article 240.
Overcurrent Protection is used 416 times and only 8 as Overcurrent Protection Device.
Overcurrent Protective 230 times 83% of those as Overcurrent Protective Device

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:

Submittal Date: Thu Sep 07 09:10:29 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-8857-NFPA 70-2024

Statement: The term “current-limiting overcurrent protective device” was revised to “current-limiting” as it is used throughout the Code in the same context without the “overcurrent protective device” portion. The application of the term in relation to overcurrent protection devices is now stated in a parenthetical. Additionally, the definition was revised editorially to be grammatically correct.

Public Input No. 4275-NFPA 70-2023 [Definition: Overcurrent Protective Device, Supplementary. (...]

Overcurrent ~~Protective Device~~ Protection Device , Supplementary. (Supplementary Overcurrent ~~Protective Device~~ Protection Device)

A device intended to provide limited overcurrent protection for specific applications and utilization equipment such as luminaires and appliances. This limited protection is in addition to the protection provided in the required branch circuit by ~~the branch-circuit overcurrent protective device~~ the overcurrent protection device . (CMP-10)

Statement of Problem and Substantiation for Public Input

The term Overcurrent Protective Device, Supplementary is changed to Overcurrent Protection Device, Supplementary to reduce confusion, increase usability and to remove inconsistencies in the document.
Overcurrent Protection is used 416 times and only 8 as Overcurrent Protection Device.
Overcurrent Protective 230 times 83% of those as Overcurrent Protective Device
Supplementary overcurrent protection is used to reference the protection type and we use the term Supplementary Overcurrent Protective Device for the device
Changing the terminology from "Protective" to "Protection" will provide consistency throughout the document.
The word "Supplementary" is also used in the code referencing heat, EGC, corrosion, circuits and control.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:
Submittal Date: Thu Sep 07 09:13:57 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: Using the term protective device aligns with the defined term ‘branch-circuit overcurrent protective device’ and changing this definition would add confusion.

Public Input No. 2990-NFPA 70-2023 [Definition: Service Conductors.]

Service Conductors.

The conductors from the service point to the service disconnecting means or service point to the power production source service disconnect . (CMP-10)

Statement of Problem and Substantiation for Public Input

According to changes in the 2023 NEC to 705.11(B), service conductors also terminate in the interconnection power production source disconnect when interconnecting electrical power production sources (like PV and ESS) with the primary source (utility). This change is very important to ensure the application of bonding of equipment and raceways containing 'service conductors' in accordance with 250.92. Including the revised text removes any confusion as to if the requirements of 250.92(A) apply to unfused conductors from the supply side connection to the service conductors for PV and ESS.

Submitter Information Verification

Submitter Full Name:	Mike Holt
Organization:	Mike Holt Enterprises Inc
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Mon Aug 28 14:39:25 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: The definition as currently shown in Article 100 is accurate. The additional language proposed is unnecessary.

Public Input No. 412-NFPA 70-2023 [Definition: Service Drop.]

~~Service~~ Utility Drop.

The overhead conductors between ~~the serving utility~~ the utility and the service point. (CMP-10)

Statement of Problem and Substantiation for Public Input

This PI is associated with several other PIs to recommend a global change from “service drop” to “utility drop” and from “service lateral” to “utility lateral.” “Service drop” appears 23 times in the Code and “service lateral” appears 15 times. There are 11 definitions that begin with the word ‘service.’ Of these, 9 are customer owned and only “service drop” and “service lateral” are utility owned and, therefore, outside the scope of the Code. “service drops” and “service laterals” are not service conductors as they do not fit the definition. Confining the word “service” to only those items that are customer owned would clear up much confusion on this topic. Appendix A shows UL 523 as having the title “telephone service drop wire” and the UL standard does, in fact, have that title. However, the text of UL 523 defines this wire as customer owned and Article 805 refers to this wire as a “drop wire.”

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 411-NFPA 70-2023 [Section No. 90.2(D)]	Global change
Public Input No. 413-NFPA 70-2023 [Definition: Service-Entrance Conductors.]	Global change
Public Input No. 414-NFPA 70-2023 [Definition: Distribution Point (Center Yard Pole) (Meter Po...]	Global change
Public Input No. 415-NFPA 70-2023 [Definition: Service Lateral.]	Global change
Public Input No. 416-NFPA 70-2023 [Section No. 800.44(A)(4)]	Global change
Public Input No. 417-NFPA 70-2023 [Section No. 700.12(F)]	Global change
Public Input No. 418-NFPA 70-2023 [Section No. 701.12(F)]	Global change
Public Input No. 419-NFPA 70-2023 [Section No. 770.44(A)(4)]	Global change
Public Input No. 420-NFPA 70-2023 [Section No. 770.44(B)]	Global change
Public Input No. 421-NFPA 70-2023 [Section No. 230.24(A)]	Global change
Public Input No. 422-NFPA 70-2023 [Section No. 230.40]	Global change
Public Input No. 423-NFPA 70-2023 [Section No. 250.24(A)(1)]	Global change
Public Input No. 424-NFPA 70-2023 [Section No. 250.24(F)]	Global change
Public Input No. 425-NFPA 70-2023 [Section No. 250.64(D)(1)]	Global change
Public Input No. 426-NFPA 70-2023 [Section No. 250.66 [Excluding any Sub-Sections]]	Global change
Public Input No. 411-NFPA 70-2023 [Section No. 90.2(D)]	
Public Input No. 413-NFPA 70-2023 [Definition: Service-Entrance Conductors.]	
Public Input No. 414-NFPA 70-2023 [Definition: Distribution Point (Center Yard Pole) (Meter Po...]	
Public Input No. 415-NFPA 70-2023 [Definition: Service Lateral.]	

Public Input No. 416-NFPA 70-2023 [Section No. 800.44(A)(4)]
Public Input No. 417-NFPA 70-2023 [Section No. 700.12(F)]
Public Input No. 418-NFPA 70-2023 [Section No. 701.12(F)]
Public Input No. 419-NFPA 70-2023 [Section No. 770.44(A)(4)]
Public Input No. 420-NFPA 70-2023 [Section No. 770.44(B)]
Public Input No. 421-NFPA 70-2023 [Section No. 230.24(A)]
Public Input No. 422-NFPA 70-2023 [Section No. 230.40]
Public Input No. 423-NFPA 70-2023 [Section No. 250.24(A)(1)]
Public Input No. 424-NFPA 70-2023 [Section No. 250.24(F)]
Public Input No. 425-NFPA 70-2023 [Section No. 250.64(D)(1)]
Public Input No. 426-NFPA 70-2023 [Section No. 250.66 [Excluding any Sub-Sections]]

Submitter Information Verification

Submitter Full Name: Eric Stromberg
Organization: Los Alamos National Laboratory
Affiliation: Self
Street Address:
City:
State:
Zip:

Submittal Date: Sat Mar 04 16:23:44 EST 2023
Committee: NEC-P10

Committee Statement

Resolution: The term “Service Drop” includes the defined term, “Service” and replacing it with “Utility” could create confusion. Deleting the word “serving” could result in misapplication of the defined term.

Public Input No. 724-NFPA 70-2023 [Definition: Service Drop.]

Service Drop.

The overhead conductors between the serving utility and the service point. Since this is on the line side of the service point, the *Code* does not apply to this when assuming the utility hasn't also chosen to adopt any provisions of the *Code* . (CMP-10)

Statement of Problem and Substantiation for Public Input

Clarified that the NEC does not apply to service drops because they are upstream of the service point, meaning it belongs to the power company.

Submitter Information Verification

Submitter Full Name: Conrad Ko
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Apr 26 00:32:11 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The PI lacks technical substantiation. Section 90.2(D)(5) states that installations under the control of the serving utility are not covered by the NEC.

Public Input No. 2276-NFPA 70-2023 [Definition: Service Equipment.]

Service Equipment.

The necessary equipment, consisting of a circuit breaker(s) or switch(es) ~~and~~ with or without fuse(s) and their accessories, connected to the serving utility and intended to constitute the main control and disconnect of the serving utility. (CMP-10)

Statement of Problem and Substantiation for Public Input

In accordance with 230.91 the service overcurrent device can be integral to the service disconnecting means or immediately adjacent. The definition implies that in order to be considered ‘service equipment’ the switches must include fuses and a non-fusible switch wouldn’t qualify as service equipment. The revised text ‘with or without fuses’ makes the requirement match 230.91.

Submitter Information Verification

Submitter Full Name:	Mike Holt
Organization:	Mike Holt Enterprises Inc
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Tue Aug 15 15:13:00 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: Service equipment includes the service disconnect and the required overcurrent protection. Changing the definition is unnecessary and could suggest that fuses are not needed for a service disconnect. The required overcurrent protection is not required to be integral to the service disconnect but is permitted to be adjacent to it.

Public Input No. 2569-NFPA 70-2023 [Definition: Service Equipment.]

Service Equipment.

The necessary equipment, consisting of a circuit breaker(s) or switch(es) and fuse(s) and their accessories, connected to the serving utility and intended to constitute the main control and disconnect of the serving utility. (CMP-10)

The necessary equipment, consisting of a circuit breaker(s) or switch(es) and fuse(s) and their accessories, connected to the serving utility and intended to constitute the main control and disconnect ~~of~~ from the serving utility.

Informational Note: Service Equipment is permitted to be utilized for other purposes in addition to the normal service disconnecting means.

Alternately, please consider adding two new definitions to Article 100: One for "Service Disconnect" and one for "Normal Service Disconnecting Means". Examples are below.

Service Disconnect: A circuit breaker(s) or switch(es) and fuse(s) and their accessories, serving as Service Equipment.

Normal Service Disconnecting Means: Service Equipment that disconnects utility power from the customer premises.

Additional Proposed Changes

File Name	Description	Approved
Proposed_Solution_Public_Input_Submission_Closing_Date_Sept_07_2023_v1.1d_08222023_aei.pdf		

Statement of Problem and Substantiation for Public Input

The term "service disconnect" is used in many instances throughout the 2023 NEC. But there is no definition of Service Disconnect in Article 100
The general rule of six disconnects maximum in 230.71(B) enables qualified personnel to quickly disconnect utility power and, if necessary, safely evacuate the premises in case of emergency. (At least, that's what I was taught many years ago by journeymen and local AHJs). The NEC implies these disconnects are the "normal service disconnecting means" – a term used in 230.40 (Exception No. 5) but also with no definition in Article 100.
It is implied that a service disconnect is a subset of service equipment. I propose a slight change to the definition of "Service Equipment" and adding an Informational Note. This clarifies that service disconnects are permitted to be utilized for other purposes in addition to the normal service disconnecting means, including bi-directional power.
In general, clarifications increase the likelihood for qualified personnel to safeguard persons and property for hazards arising from the use of electricity.
Please note that I also provided alternate solutions: proposed new definitions for "Service Disconnect" and "Normal Service Disconnecting Means". Please consider or modify the proposed solutions; providing clarification that a new definition is NOT required will be just as helpful.

Submitter Information Verification

Submitter Full Name: Albert Iaconangelo
Organization: ConnectDER, Inc.
Street Address:
City:
State:
Zip:

Submittal Date: Tue Aug 22 12:52:09 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: A service disconnect is not permitted to disconnect anything other than a service. If a switch disconnects something other than service conductors, it is not a service disconnect.

PROPOSED SOLUTION:

Article 100 – Proposed revised definition - Service Equipment. The necessary equipment, consisting of a circuit breaker(s) or switch(es) and fuse(s) and their accessories, connected to the serving utility and intended to constitute the main control and disconnect ~~of~~ from the serving utility.

> **Informational Note: Service** Equipment is permitted to be utilized for other purposes in addition to the normal service disconnecting means.

Alternately, please consider adding two new definitions to Article 100: One for “Service Disconnect” and one for “Normal Service Disconnecting Means”. Examples are below.

Service Disconnect: A circuit breaker(s) or switch(es) and fuse(s) and their accessories, serving as Service Equipment.

Normal Service Disconnecting Means: Service Equipment that disconnects utility power from the customer premises.

Public Input No. 415-NFPA 70-2023 [Definition: Service Lateral.]

~~Service~~ Utility Lateral.

The underground conductors between the ~~utility electric supply system and~~ utility and the service point. (CMP-10)

Statement of Problem and Substantiation for Public Input

This PI is associated with several other PIs to recommend a global change from “service drop” to “utility drop” and from “service lateral” to “utility lateral.” “Service drop” appears 23 times in the Code and “service lateral” appears 15 times. There are 11 definitions that begin with the word ‘service.’ Of these, 9 are customer owned and only “service drop” and “service lateral” are utility owned and, therefore, outside the scope of the Code. “service drops” and “service laterals” are not service conductors as they do not fit the definition. Confining the word “service” to only those items that are customer owned would clear up much confusion on this topic. Appendix A shows UL 523 as having the title “telephone service drop wire” and the UL standard does, in fact, have that title. However, the text of UL 523 defines this wire as customer owned and Article 805 refers to this wire as a “drop wire.”

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 411-NFPA 70-2023 [Section No. 90.2(D)]	Global change
Public Input No. 412-NFPA 70-2023 [Definition: Service Drop.]	Global change
Public Input No. 413-NFPA 70-2023 [Definition: Service-Entrance Conductors.]	Global change
Public Input No. 414-NFPA 70-2023 [Definition: Distribution Point (Center Yard Pole) (Meter Po...]	Global change
Public Input No. 416-NFPA 70-2023 [Section No. 800.44(A)(4)]	Global change
Public Input No. 417-NFPA 70-2023 [Section No. 700.12(F)]	Global change
Public Input No. 418-NFPA 70-2023 [Section No. 701.12(F)]	Global change
Public Input No. 419-NFPA 70-2023 [Section No. 770.44(A)(4)]	Global change
Public Input No. 420-NFPA 70-2023 [Section No. 770.44(B)]	Global change
Public Input No. 421-NFPA 70-2023 [Section No. 230.24(A)]	Global change
Public Input No. 422-NFPA 70-2023 [Section No. 230.40]	Global change
Public Input No. 423-NFPA 70-2023 [Section No. 250.24(A)(1)]	Global change
Public Input No. 424-NFPA 70-2023 [Section No. 250.24(F)]	Global change
Public Input No. 425-NFPA 70-2023 [Section No. 250.64(D)(1)]	Global change
Public Input No. 426-NFPA 70-2023 [Section No. 250.66 [Excluding any Sub-Sections]]	Global change
Public Input No. 411-NFPA 70-2023 [Section No. 90.2(D)]	
Public Input No. 412-NFPA 70-2023 [Definition: Service Drop.]	
Public Input No. 413-NFPA 70-2023 [Definition: Service-Entrance Conductors.]	

Public Input No. 414-NFPA 70-2023 [Definition: Distribution Point (Center Yard Pole) (Meter Po...]
Public Input No. 416-NFPA 70-2023 [Section No. 800.44(A)(4)]
Public Input No. 417-NFPA 70-2023 [Section No. 700.12(F)]
Public Input No. 418-NFPA 70-2023 [Section No. 701.12(F)]
Public Input No. 419-NFPA 70-2023 [Section No. 770.44(A)(4)]
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Public Input No. 422-NFPA 70-2023 [Section No. 230.40]
Public Input No. 423-NFPA 70-2023 [Section No. 250.24(A)(1)]
Public Input No. 424-NFPA 70-2023 [Section No. 250.24(F)]
Public Input No. 425-NFPA 70-2023 [Section No. 250.64(D)(1)]
Public Input No. 426-NFPA 70-2023 [Section No. 250.66 [Excluding any Sub-Sections]]

Submitter Information Verification

Submitter Full Name:	Eric Stromberg
Organization:	Los Alamos National Laboratory
Affiliation:	Self
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Sat Mar 04 16:32:32 EST 2023
Committee:	NEC-P10

Committee Statement

Resolution: The term “Service Lateral” includes the defined term, “Service” and replacing it with “Utility” could create confusion.

Public Input No. 807-NFPA 70-2023 [Definition: Service Lateral.]

Service Lateral.

The underground conductors between the utility electric supply system and the service point. Since this is on the line side of the service point, the *Code* does not apply to this when assuming the utility hasn't also chosen to adopt any provisions of the *Code* . (CMP-10)

Statement of Problem and Substantiation for Public Input

Clarified that the NEC does not apply to service drops because they are upstream of the service point, meaning it belongs to the power company.

Submitter Information Verification

Submitter Full Name: Conrad Ko
Organization: [Not Specified]
Street Address:
City:
State:
Zip:

Submittal Date: Fri May 12 19:16:12 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The PI lacks technical substantiation. Section 90.2(D)(5) states that installations under the control of the serving utility are not covered by the NEC.

Public Input No. 413-NFPA 70-2023 [Definition: Service-Entrance Conductors.]

Service-Entrance Conductors.

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

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

Statement of Problem and Substantiation for Public Input

This PI is associated with several other PIs to recommend a global change from “service drop” to “utility drop” and from “service lateral” to “utility lateral.” “Service drop” appears 23 times in the Code and “service lateral” appears 15 times. There are 11 definitions that begin with the word ‘service.’ Of these, 9 are customer owned and only “service drop” and “service lateral” are utility owned and, therefore, outside the scope of the Code. “service drops” and “service laterals” are not service conductors as they do not fit the definition. Confining the word “service” to only those items that are customer owned would clear up much confusion on this topic. Appendix A shows UL 523 as having the title “telephone service drop wire” and the UL standard does, in fact, have that title. However, the text of UL 523 defines this wire as customer owned and Article 805 refers to this wire as a “drop wire.”

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 411-NFPA 70-2023 [Section No. 90.2(D)]	Global change
Public Input No. 412-NFPA 70-2023 [Definition: Service Drop.]	Global change
Public Input No. 414-NFPA 70-2023 [Definition: Distribution Point (Center Yard Pole) (Meter Po...]	Global change
Public Input No. 415-NFPA 70-2023 [Definition: Service Lateral.]	Global change
Public Input No. 416-NFPA 70-2023 [Section No. 800.44(A)(4)]	Global change
Public Input No. 417-NFPA 70-2023 [Section No. 700.12(F)]	Global change
Public Input No. 418-NFPA 70-2023 [Section No. 701.12(F)]	Global change
Public Input No. 419-NFPA 70-2023 [Section No. 770.44(A)(4)]	Global change
Public Input No. 420-NFPA 70-2023 [Section No. 770.44(B)]	Global change
Public Input No. 421-NFPA 70-2023 [Section No. 230.24(A)]	Global change
Public Input No. 422-NFPA 70-2023 [Section No. 230.40]	Global change
Public Input No. 423-NFPA 70-2023 [Section No. 250.24(A)(1)]	Global change
Public Input No. 424-NFPA 70-2023 [Section No. 250.24(F)]	Global change
Public Input No. 425-NFPA 70-2023 [Section No. 250.64(D)(1)]	Global change
Public Input No. 426-NFPA 70-2023 [Section No. 250.66 [Excluding any Sub-Sections]]	Global change
Public Input No. 411-NFPA 70-2023 [Section No. 90.2(D)]	
Public Input No. 412-NFPA 70-2023 [Definition: Service Drop.]	

Public Input No. 414-NFPA 70-2023 [Definition: Distribution Point (Center Yard Pole) (Meter Po...]
Public Input No. 415-NFPA 70-2023 [Definition: Service Lateral.]
Public Input No. 416-NFPA 70-2023 [Section No. 800.44(A)(4)]
Public Input No. 417-NFPA 70-2023 [Section No. 700.12(F)]
Public Input No. 418-NFPA 70-2023 [Section No. 701.12(F)]
Public Input No. 419-NFPA 70-2023 [Section No. 770.44(A)(4)]
Public Input No. 420-NFPA 70-2023 [Section No. 770.44(B)]
Public Input No. 421-NFPA 70-2023 [Section No. 230.24(A)]
Public Input No. 422-NFPA 70-2023 [Section No. 230.40]
Public Input No. 423-NFPA 70-2023 [Section No. 250.24(A)(1)]
Public Input No. 424-NFPA 70-2023 [Section No. 250.24(F)]
Public Input No. 425-NFPA 70-2023 [Section No. 250.64(D)(1)]
Public Input No. 426-NFPA 70-2023 [Section No. 250.66 [Excluding any Sub-Sections]]

Submitter Information Verification

Submitter Full Name: Eric Stromberg
Organization: Los Alamos National Laboratory
Affiliation: Self
Street Address:
City:
State:
Zip:
Submittal Date: Sat Mar 04 16:27:20 EST 2023
Committee: NEC-P10

Committee Statement

Resolution: “Service drop” and “Service Lateral” are defined terms, and replacing “service” with “utility” could cause confusion.

Public Input No. 1569-NFPA 70-2023 [Definition: Service.]

Service.

The conductors and equipment connecting the serving utility and/or other reliable continuous power sources, including *power production equipment* and *energy storage systems,* to the wiring system of the premises served. (CMP-10)

Informational Note No. 1: See definition of *Power Production Equipment.*

Informational Note No. 2: See definition of *Energy Storage System (ESS).*

Informational Note No. 3: The authority having jurisdiction may need to be referred to regarding considerations of an special permission for reliable power sources in addition to the serving utility.

Statement of Problem and Substantiation for Public Input

The definition of "Service" no longer is exclusively connecting the serving utility. The current definition does not align with evolving industry trends that indicate the servicing utility is one of many sources of power for a premises. The serving utility is no longer being relied upon as the normal source of power for a premises. The proposed revision aligns with increased efforts to address continuity of service through more expanded use of microgrids to ensure resiliency of electrical service, whether from a utility or from another proven reliable and justified source of power. In many installations the serving utility is increasingly becoming an alternative source that supplements a customer installed reliable power system of multiple sources, such as a microgrids, and by adding the other reliable continuous power sources, including privately owned power production equipment and energy storage systems (ESS). The definition allows for the connection of multiple sources.

Submitter Information Verification

Submitter Full Name:	Kyle Krueger
Organization:	NECA
Affiliation:	NECA
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Tue Jul 25 15:14:24 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: Anything other than the serving utility is not a service. The proposed language would not be accurate for the definition of a service. The existing language addresses protection of alternative power sources.

Public Input No. 723-NFPA 70-2023 [Definition: Service.]

Service.

The conductors and equipment connecting the ~~serving~~ electrically nearest distribution transformer of the serving utility to ~~the wiring system of the premises served~~ (and including) the service equipment . (CMP-10)

Statement of Problem and Substantiation for Public Input

The service equipment is part of the service. Under the old definition, it almost contradicted itself because it used the ambiguous term "wiring system of the premises served", which almost implies "premises wiring". However, premises wiring excludes the service equipment because the service equipment is on the load side of the service point. Under this new definition, it makes it clear that the service conductors and service equipment are where the service and premises wiring overlap. This also makes it crystal clear where the service starts, because under the old definition, one may interpret the service as starting on the nearest utility pole even though the nearest distribution transformer is located a few poles away.

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Submittal Date: Wed Apr 26 00:23:27 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The service point of an electrical system is defined in Article 100 and the location of a service point on an electrical system is determined by the serving utility. In addition, the definition of premises wiring includes the service equipment and does not conflict with the definition of ”service.” The proposed change to the definition of ”service” would cause confusion.

Public Input No. 3892-NFPA 70-2023 [Definition: Short-Circuit Current Rating.]

Short-Circuit Current Rating.

The prospective symmetrical fault current at a nominal voltage to which ~~an apparatus or system is~~ equipment is able to be connected without sustaining damage exceeding defined acceptance criteria. (CMP-10)

Statement of Problem and Substantiation for Public Input

"Equipment" increases clarity and usability by utilizing a defined term.

Submitter Information Verification

Submitter Full Name: jeremy omess
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Submittal Date: Wed Sep 06 09:15:15 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-8865-NFPA 70-2024

Statement: The definition of "equipment" includes the term "apparatus", whereas the term "apparatus" itself is not a defined term in the NEC. The proposed change adds clarity to the definition of short-circuit current rating.

Public Input No. 178-NFPA 70-2023 [Definition: Tap Conductor.]

Tap Conductor.

A conductor, other than a service conductor, that originates at the output terminals of a generator, or that has overcurrent protection ahead of its point of supply that exceeds the value permitted for similar conductors that are protected as described elsewhere in 240.4. (240) (CMP-10)

Statement of Problem and Substantiation for Public Input

The rule in 240.21(G) applies where there is a single set of conductors from the generator terminals. Often there are multiple sets of conductors from the generator terminals and no code rules for that application. If the generator conductors are included as tap conductors, then we would have clear guidance, in 240.21(B), on the required overcurrent protection for multiple sets of conductors that extend from generator terminals. The current definition does not apply because there is no overcurrent protection on the line side of the point where the conductors receive their supply.

Submitter Information Verification

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City:
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Submittal Date: Tue Jan 17 13:10:42 EST 2023
Committee: NEC-P10

Committee Statement

Resolution: Section 240.21(G) is not necessarily limited to a single set of conductors connected to a generator’s terminals. In addition, since there is not overcurrent protection located ahead of the conductors connected to the generator’s terminals, they do not meet the definition of tap conductors. Section 240.21(G) in conjunction with 445.12 and 445.13 already address the submitters concerns.

Public Input No. 539-NFPA 70-2023 [New Definition after Definition: Disconnecting Means.]

Disconnecting Means, Service (Service Disconnecting Means)

A device that is connected to service conductors and disconnects the premises wiring system or equipment from the service conductors to which it is connected.

Statement of Problem and Substantiation for Public Input

The term "service disconnect" is used in many locations within the NEC but yet is not currently a defined term. Including this definition is critical to ensure that when a device meets this definition it is treated appropriately as required elsewhere in this Code. It is important for the electrical professional to know when a device connects a power system to the serving utility. The definition includes the fact that this disconnect will be the disconnect that has service conductors landed on the disconnect. Including this definition will help the users of the Code identify these devices in the power system and ensure barriers and labeling requirements to name a couples example requirements are triggered as found elsewhere in this Code. Once this term is defined, coke making bodies can then develop appropriate exceptions when required should a code making panel body desire to provide exceptions for the various requirements that follow a disconnect that meets this definition.

Submitter Information Verification

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Submittal Date: Thu Apr 06 06:52:57 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9148-NFPA 70-2024

Statement: A service disconnect is a commonly used term which was previously not defined. A definition is added to provide users with clarity. The alternate term service disconnecting means is used interchangeably and added as an equivalent.

Public Input No. 592-NFPA 70-2023 [New Definition after Definition: Disconnecting Means.]

Disconnecting Means, Meter (Meter Disconnecting Means) (Meter Disconnect)

A disconnect that is connected to service conductors and disconnects a meter from the service conductors to which it is connected.

Statement of Problem and Substantiation for Public Input

The term "meter disconnect" is used in various locations within the NEC and deserves its own definition to segregate this disconnect from other types of disconnects including a service disconnect. Including this definition is critical to ensure that when a device meets this definition it is treated appropriately as required elsewhere in this Code. It is important for the electrical professional to know when a device connects a power system to the serving utility. The definition includes the fact that this disconnect will be the disconnect that has service conductors landed on the disconnect. Including this definition will help the users of the Code identify these devices in the power system and properly differentiate them from other types of disconnects.

Submitter Information Verification

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Submittal Date: Tue Apr 11 21:00:41 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The proposed definition of a meter disconnecting means would not differentiate it from the definition provided for a service disconnect/service disconnecting means under the correlating First Revision.

Public Input No. 2556-NFPA 70-2023 [New Definition after Definition: Metal Shield Connections.]

TITLE OF NEW CONTENT

Metering Centers (Meter Center). Panelboards or enclosed panelboards containing one or more meter sockets. (CMP-10)

Statement of Problem and Substantiation for Public Input

The term "metering center" was first included in Section 230.71(B) of the 2020 NEC®. The term is not defined, but is intended to identify a panelboard or enclosed panelboard that contains one or more meter sockets. This is based on how the term is defined and used in the Standard for Panelboards, UL 67. The alternate term "Meter Center", while not used in the text, is synonymous with the term metering center; therefore, based on 2.1.2.8 of the NEC Style Manual, it is included in the definition. Lastly, it is proposed that this definition be assigned to CMP-10, as it has purview over that part of the Code that is impacted.

Submitter Information Verification

Submitter Full Name: Robert Osborne

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Submittal Date: Mon Aug 21 15:47:15 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: FR-8867-NFPA 70-2024

Statement: The term metering center is used in the NEC and used in the Standards for Panelboards UL 67. The addition of the definition of metering centers adds clarity and usability to the Code.

Public Input No. 4061-NFPA 70-2023 [New Definition after Definition: Overcurrent.]

Overcurrent Protection

A form of protection in an electric circuit which prevents damage resulting from excessive current; interrupts the flow of current at a predetermined value.

Statement of Problem and Substantiation for Public Input

The term Overcurrent Protection is not defined in the code. It is often used out of context because it is not a defined term.
The proposed term appears in over 170 sections and should be defined.
Overcurrent Protection is used 416 times and only 8 as Overcurrent Protection Device.
Overcurrent Protective 230 times 83% of those as Overcurrent Protective Device

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
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City:
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Submittal Date: Wed Sep 06 15:18:13 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: A task group is going to be created to review overcurrent protection terminology. The terms and their uses need to be consistent throughout the Code.

Public Input No. 3631-NFPA 70-2023 [New Definition after Definition: Transformer.]

Transformer Secondary Conductor

A conductor, other than a service conductor, that originates at the secondary winding of a transformer.

Statement of Problem and Substantiation for Public Input

This public input defines a term that is used in 13 different sections within the NEC. It is important to define this term as new transformers are on the market that include a secondary overcurrent protective device yet listed as a transformer. This new defined term will add clarity to ensure that the correct terms are used to identify the correct requirements in the NEC. The conductor on the secondary of a transformer that includes a secondary circuit breaker as part of the transformer is a feeder and not transformer secondary conductors. The addition of this definition adds clarity for the user of the Code.

Submitter Information Verification

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Submittal Date: Tue Sep 05 10:44:51 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-8885-NFPA 70-2024

Statement: This public input defines a term that is used in 13 different sections within the NEC. It is important to define this term as new transformers are on the market that include a secondary overcurrent protective device yet listed as a transformer. This new defined term will add clarity to ensure that the correct terms are used to identify the correct requirements in the NEC. The conductor on the secondary of a transformer that includes a secondary circuit breaker as part of the transformer is a feeder and not transformer secondary conductors. The addition of this definition adds clarity for the user of the Code.

Public Input No. 2627-NFPA 70-2023 [Section No. 215.1]

215.1 Scope.

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

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

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. The text is revised to to comply with the NEC Style Manual Section 4.1.4, regarding the use of Parts.
4.1.4 References to an Entire Article. References shall not be made to an entire article, except for the Article 100 or where referenced to provide the necessary context. References to specific parts within articles shall be permitted. References to all parts of an article shall not be permitted. The article number shall precede the part number.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name: David Williams
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Submittal Date: Wed Aug 23 21:18:19 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9018-NFPA 70-2024
Statement: The informational note is being revised to comply with the NEC Style Manual section 4.1.4.

Public Input No. 1824-NFPA 70-2023 [Section No. 215.2(A)]

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

~~Feeder conductors shall have an ampacity not less than the larger of 215.2(A)(1) or (A)(2) 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 Informative Annex D for Examples D1 through D11.~~

~~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, Informational Note for voltage drop for branch circuits.~~

Statement of Problem and Substantiation for Public Input

Sizing conductors to 125% of the continuous load is only required when the conductor is connected to an overcurrent device. The same rules exist in Article 210 and Article 215. Since these rules deal with overcurrent devices, this PI suggests consolidating the rules, deleting them from 210 and 215, and moving them into Article 240.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 1822-NFPA 70-2023 [New Section after 240.16]	New section in 240
Public Input No. 1823-NFPA 70-2023 [Section No. 210.19(A)]	Deletion of section in 210
Public Input No. 1822-NFPA 70-2023 [New Section after 240.16]	
Public Input No. 1823-NFPA 70-2023 [Section No. 210.19(A)]	

Submitter Information Verification

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Submittal Date: Sat Aug 05 14:50:42 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: This section addresses feeder conductor sizing, not overcurrent protection, and therefore belongs in article 215 and not in article 240.

Public Input No. 472-NFPA 70-2023 [Section No. 215.2(A)]

(A) General.

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

(1)~~– Continuous and Noncontinuous Loads~~ Without Adjustment and Correction Factors .

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~~ With **Adjustment** ~~or~~ **and** **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 Informative Annex D for Examples D1 through D11.

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, Informational Note for voltage drop for branch circuits.

Statement of Problem and Substantiation for Public Input

The proposed section headings are borrowed from 690.8(B) and clarify the two different uses of the word "ampacity" in this section. As currently written, the use of the word "ampacity" in section 1 is confusing, because the definition of ampacity and section 310.15 lead to an interpretation that the term "ampacity" always includes the application of adjustment and correction factors.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 471-NFPA 70-2023 [Section No. 210.19(A)]	Identical change for branch circuits
Public Input No. 473-NFPA 70-2023 [Section No. 230.42(A)]	Identical change for service entrance conductors
Public Input No. 471-NFPA 70-2023 [Section No. 210.19(A)]	
Public Input No. 473-NFPA 70-2023 [Section No. 230.42(A)]	

Submitter Information Verification

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Submittal Date: Wed Mar 15 15:00:25 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The proposed title revisions do not add clarity because the existing title language is utilized in the sections.

Public Input No. 4384-NFPA 70-2023 [Section No. 215.2(A)(1)]

(1) Continuous and Noncontinuous Loads.

The minimum feeder conductor size shall have a rating not less than the calculated load to be carried, determined in accordance with Part III, IV or V of Article 220, as applicable. 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.~~

Statement of Problem and Substantiation for Public Input

The rating of overcurrent protection/disconnecting means and of conductors for services and feeders currently appears to differ. The rating for services relies on the load calculations in III, IV or V of article 220, while the rating of feeder conductors asks the user to make an entirely new calculation accounting separately for continuous and noncontinuous loads. It is unclear if this new calculation for feeders includes demand factors and other assumptions embedded throughout article 220. Following this procedure for feeders will result in a different load calculation than the one derived from article 220. We propose aligning the statements for feeders and for services by relying on the current language for services. In this case, the rating for feeders would be based solely on the load calculated in article 220. This proposal assumes that special accounting at 125% for continuous loads are most relevant for branch circuit overcurrent protection, whereas feeders and services, because of the diversity of loads they serve, are unlikely to be overloaded by a single branch circuit operating continuously.

Submitter Information Verification

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Submittal Date: Thu Sep 07 13:41:42 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: Sizing conductors at 125 percent for continuous loads is also relevant to feeders and services, and not just branch circuits.

Public Input No. 495-NFPA 70-2023 [Section No. 215.2(A)(1)]

(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.

Exception No. 4: Where the overcurrent device is sized per 215.3 and does not exceed 800A, the ampacity of the feeder conductors shall be permitted to be not less than the sum of the continuous load plus the noncontinuous load, provided the ampacity is more than the next lower standard rating of overcurrent device in accordance with 240.4(B).

Statement of Problem and Substantiation for Public Input

Recall that the 125% continuous use factor exists in the NEC solely due to the limitation of an overcurrent device installed in an enclosure which may allow heat buildup greater than would occur in the free air testing conditions of the applicable UL standard, possibly resulting in nuisance tripping when the overcurrent device is loaded continuously at its rating. In particular, there is no need to upsize the conductor itself based solely on the continuous loading; the ampacity is by the Article 100 definition a continuous rating. Any need to upsize the conductor derives from the need to upsize the overcurrent device and then to ensure than the conductor is still adequately protected under 240.4.

This amendment proposes to allow the use of 240.4(B) as indicated, which use would otherwise be circumvented by 215.2(A)(1). To illustrate the effect, consider a 48A continuous load (such as EVSEs, an increasingly common new installation) installed with a 60A overcurrent device and possibly supplied by 6/2 NM cable. NM cable is limited to the 60C ampacity column, so before adjustment and correction 6/2 NM has an ampacity of 55A.

Now the 55A rating is a continuous rating, and greater than the 48A continuous load, so the cable will not be overloaded during normal operating conditions. And 60A is 125% of the 48A continuous load, so the overcurrent device rating complies with 215.3 and should not lead to nuisance tripping. The only remaining question as far as the safety of the installation is whether a 60A overcurrent device can protect the 55A ampacity conductor with a 48A continuous load during abnormal conditions.

For the case of a non-continuous load of 55A, 240.4(B) does allow a 60A overcurrent device to protect a 55A ampacity conductor. The difference in loading conditions is not material to whether or not the 60A overcurrent device can properly protect a 55A ampacity conductor. That is, for the 55A non-continuous load case, 240.4(B) tells us that the overcurrent device's protection curve is suitably more conservative than the 55A ampacity conductor's damage curve, so that the 55A ampacity conductor is protected. The same confidence about abnormal conditions applies regardless of normal loading conditions, so the 55A ampacity conductor is protected by a 60A overcurrent device for the 48A continuous load case as well.

As such, since the non-continuous configuration discussed is allowed under 240.4(B), the continuous configuration should also be allowed. It is currently disallowed only due to the requirement in 215.2(A)(1) for the 125% continuous use factor. The new exception provides the narrowly tailored relief necessary to apply 240.4(B) to continuous loads.

Related Public Inputs for This Document

Related Input	Relationship

Public Input No. 494-NFPA 70-2023 [Section No. 210.19(A)]	Identical change for branch-circuit conductors
Public Input No. 497-NFPA 70-2023 [Section No. 230.42(A)(1)]	Identical change for service-entrance conductors
Public Input No. 494-NFPA 70-2023 [Section No. 210.19(A)]	
Public Input No. 497-NFPA 70-2023 [Section No. 230.42(A)(1)]	

Submitter Information Verification

Submitter Full Name:	Wayne Whitney
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Submittal Date:	Tue Mar 21 13:40:45 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: The substantiation does not follow current NEC load calculations when sizing for feeder conductors. The 125 percent load calculations are based on the load being a continuous load. The 60A overcurrent protection device is designed and tested to protect a 60A rated conductor.

Public Input No. 183-NFPA 70-2023 [Section No. 215.2(B)]

(B) Grounded Conductor.

~~The size of the~~ Where a feeder circuit has a grounded conductor, it 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.

Statement of Problem and Substantiation for Public Input

Feeder circuits are not required to have a grounded circuit conductor, but the current language suggests that a grounded conductor must be installed with each feeder circuit.

Submitter Information Verification

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Zip:	
Submittal Date:	Tue Jan 17 13:39:15 EST 2023
Committee:	NEC-P10

Committee Statement

Resolution: FR-9000-NFPA 70-2024

Statement: The revised language clarifies that a grounded conductor is not always provided in a feeder circuit, but must comply with this section if it is provided. The revised language aligns with the NEC Style manual 3.5.4.

Public Input No. 2628-NFPA 70-2023 [Section No. 215.3]

215.3 Overcurrent Protection.

Feeders shall be protected against overcurrent in accordance with ~~Part I of~~ Article 240 , Part I . Where a feeder supplies continuous loads or any combination of continuous and noncontinuous loads, the rating of the overcurrent device shall not be less than the noncontinuous load plus 125 percent of the continuous load.

Exception: Where the assembly, including the overcurrent devices protecting the feeder(s), is listed for operation at 100 percent of its rating, the ampere rating of the overcurrent device shall be permitted to be not less than the sum of the continuous load plus the noncontinuous load.

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. The text is revised to to comply with the NEC Style Manual Section 4.1.4, regarding the use of Parts.
4.1.4 References to an Entire Article. References shall not be made to an entire article, except for the Article 100 or where referenced to provide the necessary context. References to specific parts within articles shall be permitted. References to all parts of an article shall not be permitted. The article number shall precede the part number.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

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Submittal Date: Wed Aug 23 21:19:23 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9001-NFPA 70-2024
Statement: The language is being revised to comply with the NEC Style Manual section 4.1.4.

Public Input No. 4369-NFPA 70-2023 [Section No. 215.3]

215.3 Overcurrent Protection.

Feeders shall be protected against overcurrent in accordance with Part I of Article 240. ~~Where a feeder supplies continuous loads or any combination of continuous and noncontinuous loads, the rating of the~~ The overcurrent device shall ~~not be less~~ have a rating not less than the ~~noncontinuous load plus 125 percent of the continuous load.~~

~~Exception: Where the assembly, including the overcurrent devices protecting the feeder(s), is listed for operation at 100 percent of its rating, the ampere rating of the overcurrent device shall be permitted to be not less than the sum of the continuous load plus the noncontinuous load~~

calculated load to be carried, determined in accordance with Part III, IV or V of Article 220, as applicable .

Statement of Problem and Substantiation for Public Input

The rating of overcurrent protection/disconnecting means for services (230.79) and feeders (215.3) currently appears to differ. The rating for services relies on the load calculations in III, IV or V of article 220, while the rating of feeders asks the user to make an entirely new calculation accounting separately for continuous and noncontinuous loads. It is unclear if this new calculation for feeders includes demand factors and other assumptions embedded throughout article 220. Following this procedure for feeders will result in a different load calculation than the one derived from article 220. We propose aligning the statements for feeders and for services by relying on the current language for service disconnecting means. In this case, the rating for feeders would be based solely on the load calculated in article 220. We suggest similar revisions to the conductor sizing calculations in 215.2. This proposal assumes that special accounting at 125% for continuous loads are most relevant for branch circuit overcurrent protection, whereas feeders and services, because of the diversity of loads they serve, are unlikely to be overloaded by a single branch circuit operating continuously.

Submitter Information Verification

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Submittal Date: Thu Sep 07 13:10:31 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: Sizing conductors at 125 percent for continuous loads is also relevant to feeders and services, and not just branch circuits.

Public Input No. 2937-NFPA 70-2023 [Section No. 215.6]

215.6 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.~~ If the equipment grounding conductor is of the wire type, it must be sized in accordance with 250.122.

Statement of Problem and Substantiation for Public Input

Added text to inform Code users how to size equipment grounding conductors of the wire type.
Deleted text referencing 250.32 because that is already a requirement and there is no need for redundancy. These proposed revisions will improve clarity for Code users.

Submitter Information Verification

Submitter Full Name: Mike Holt
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Submittal Date: Mon Aug 28 12:26:13 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9002-NFPA 70-2024

Statement: The deleted language is recognized as redundant and a general grounding requirement. The proposed new language by the submitter is redundant and a general grounding requirement that is not necessary in this section.

Public Input No. 1909-NFPA 70-2023 [New Section after 215.7]

215.8 Arc Fault Protection

Require feeder conductors which pass through a 210.12 AFCI protected area to have AFCI protection.

Statement of Problem and Substantiation for Public Input

As an example, it is not uncommon for a feeder supplying a subpanel in a non-AFCI protected area and for that feeder to pass through a wall cavity that also contains AFCI protected branch circuits conductors. While the AFCI protected branch circuits conductors will be protected from someone hanging a picture on the wall with a nail, the feeder conductors in the same wall cavity are not AFCI protected simply because the feeder is not directly supplying a device or equipment in a AFCI protected area.

Submitter Information Verification

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Submittal Date: Mon Aug 07 14:46:26 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: No technical substantiation is provided. Currently 210.12 only requires 10-, 15-, and 20-ampere branch circuits supplying outlets or devices. A “pass through” feeder could easily exceed these values.

Public Input No. 1641-NFPA 70-2023 [Section No. 215.10]

215.10 Ground-Fault Protection of Equipment.

Each feeder disconnect rated 1000 amperes or more and installed on solidly grounded wye electrical systems of more than 150 volts to ground, but not exceeding 1000 volts phase-to-phase, shall be provided with ground-fault protection of equipment in accordance with 230.95.

Informational Note: See 517.17 for buildings that contain health care occupancies.

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

Exception No. 2: This section shall not apply if ground-fault protection of equipment is provided on the supply side of the feeder and on the load side of any transformer supplying the feeder.

Exception No. 3: If temporary feeder conductors are used to connect a generator to a facility for repair, maintenance, or emergencies, ground-fault protection of equipment shall not be required. Temporary feeders without ground-fault protection shall be permitted for the time period necessary but shall not exceed 90 days.

Exception No. 4: For fused disconnects, where the available fault current, at the fused disconnect, is 10,000 amperes or greater, the ground-fault protection provisions of this section shall not apply if the fuses have a clearing time of 0.07 seconds or less at the lower of the calculated minimum available arcing current or 38% of the available fault current or if the disconnect switch complies with Section 240.67(B)(1), 240.67(B)(3), or 240.67(B)(4). and is set to operate at the lower of the calculated minimum arcing current or 38% of the available fault current.

Exception No. 5: For circuit breakers, where the available fault current, at the circuit breaker, is 10,000 amperes or greater, the ground-fault protection provisions of this section shall not apply if the circuit breaker complies with Section 240.87(B)(2), 240.87(B)(4), 240.87(B)(5), or 240.87(B)(6). and is set to operate at the lower of the calculated minimum arcing current or 38% of the available fault current.

Additional Proposed Changes

File Name	Description	Approved
215.10.docx	215.10	

Statement of Problem and Substantiation for Public Input

Executive Summary:

We can now accurately predict the minimum three-phase arcing current, along with the minimum sustainable line-to-ground arcing current, for an arcing ground fault. Knowing these currents, we can determine whether or not the arc energy reduction methods in proposed Exceptions 4 and 5 will operate at, or below, those levels. If they do operate at or below those levels, the equipment damage will be just a small percentage of that allowed by the GFPE requirements of 230.95. This applies to all available fault currents of 10,000 amperes or greater.

Background:

A requirement (230.95) for ground fault protection of equipment (GFPE) was added to the 1971 NEC® because 480/277 volt, solidly grounded wye services, protected by 1000 ampere and larger overcurrent protective devices, were burning down due to arcing ground faults. 208/120 volt services and those services protected by smaller overcurrent protective devices were not burning down, so they weren't included in the new GFPE requirement. Over many Code cycles, GFPE requirements were also added for branch circuits (210.13), feeders (215.10), and equipment (240.13). In all cases, the intent was to limit, not eliminate, damage to the switchboard, switchgear, panelboard or equipment being supplied by the 1000 ampere and larger overcurrent protective device.

Present Day:

The electrical industry has evolved considerably since those early GFPE requirements were introduced. In those years, J. R. Dunki-Jacobs, Harris I. Stanback, and R. H. Kaufman authored numerous ground-breaking papers on arcing ground faults and the need for ground fault protection. They accomplished a great deal and their determination that the minimum sustainable line-to-ground arcing fault on a 480/277 volt system was 38% of the available bolted fault current is very close to the values predicted today by IEEE1584-2019. In recent editions of the NEC®, Sections were added to require the protection of an employee that is exposed to dangerous levels of incident energy while working on energized equipment. To avoid serious injuries, employees, working on or near energized equipment, can only withstand a small fraction of the incident energy to which equipment may be subjected by the allowances of 230.95(A). This substantiation compares the levels of equipment damage allowed by existing 230.95(A) with the levels allowed by the employee arc-flash protection requirements of 240.67 and 240.87. It shows that the equipment damage allowed by the employee arc-flash protection requirements of 240.67 and 240.87 is just a small fraction of that allowed by 230.95(A).

The following examples utilize IEEE 1584-2018 for a 480 volt arcing fault with 32mm equipment spacing, in a 20"x20"x20" box and an HCB (horizontal conductors in a metal enclosure) configuration. Equipment damage is described in terms of kW-cycles which is a product of arcing current (kA) X number of arcing cycles (cycles) X arc voltage (100 volts on a 480 system).

Worst Case Equipment Damage with 10 kA Available Fault Current

As allowed by 230.95(A). The IEEE 1584-2018 minimum arcing current is 6.09kA. Using the maximum 230.95(A) opening time of 60 cycles, the equipment damage is (6.09 kA X 60 cycles X 100 arcing volts) = 36,540 kW-cycles. See Figure 1.

As allowed by Proposed Exception No. 4. The IEEE 1584-2018 minimum arcing current is 6.09kA. Assuming the maximum opening time of 4.2 cycles (0.07 seconds) for 240.67(B), the equipment damage is 6.09 kA X 4.2 cycles X 100 arcing volts) = 2,558 kW-cycles. Assuming an opening time of 7 cycles for 240.67(B)(1) and (B)(3), the equipment damage is (6.09 kA X 7 cycles X 100 arcing volts = 4,263 kW-cycles. Assuming an opening time of 1/2 cycle for 240.67(B)(4), the equipment damage is (6.09 kA X 0.5 cycles X 100 arcing volts) = 305 kW-cycles. Worst-case damage for the minimum arcing current with this proposed exception for fusible switches (4,263 kW-cycles) is less than 12% of the worst-case damage allowed by 230.95(A) (36,540 kW-cycles). See Figure 1.

As allowed by Proposed Exception No. 5. The IEEE 1584-2018 minimum arcing current is 6.09kA. Assuming an opening time of 4 cycles for 240.87(B)(1), (B)(2), or (B)(4), the equipment damage is (6.09 kA X 4.0 cycles X 100 arcing volts) = 2,436 kW-cycles. Assuming an opening time of 3 cycles for 240.87(B)(5) or (B)(6), the equipment damage is (6.09 kA X 3 cycles X 100 arcing volts) = 1,827 kW-cycles. Worst-case damage for the minimum arcing current with this proposed exception for circuit breakers (2,426 KW-Cycles) is less than 7% of the worst-case damage allowed by 230.95(A) (36,540 kW-cycles). See Figure 1.

Worst Case Equipment Damage with 25 kA Available Fault Current

As allowed by 230.95(A). The IEEE 1584-2018 minimum arcing current is 15.21kA. Using the maximum 230.95(A) opening time of 60 cycles, the equipment damage is (15.21 kA X 60 cycles X 100 arcing volts) = 91,260 kW-cycles. See Figure 1.

As allowed by Proposed Exception No. 4. The IEEE 1584-2018 minimum arcing current is 15.21kA. Assuming the maximum opening time of 4.2 cycles for 240.67(B), the equipment damage is (15.21 kA X 4.2 cycles X 100 arcing volts) = 6,388 kW-cycles. Assuming an opening time of 7 cycles for 240.67(B)(1) and (B)(3), the equipment damage is (15.21 kA X 7 cycles X 100 arcing volts) = 10,647 kW-cycles. Assuming an opening time of 1/2 cycle for 240.67(B)(4), the equipment damage is (15.21 kA X 0.5 cycles X 100 arcing volts) = 761 kW-cycles. Worst-case damage for the minimum arcing current with this proposed exception for fusible switches (10,647 kW-cycles) is less than 12% of the worst-case damage allowed by 230.95(A) (91,260 kW-cycles). See Figure 1.

As allowed by Proposed Exception No. 5. The IEEE 1584-2018 minimum arcing current is 15.21kA. Assuming an opening time of 4 cycles for 240.87(B)(1), (B)(2), or (B)(4), the equipment damage is (15.21 kA X 4 cycles X 100 arcing volts) = 6,084 kW-cycles. Assuming an opening time of 3 cycles for 240.87(B)(5) or (B)(6), the equipment damage is (15,21 kA X 3 cycles X 100 arcing volts) = 4,563 kW-cycles. Worst-case damage for the minimum arcing current with this proposed exception for circuit breakers (6,084 kW-Cycles) is less than 7% of the worst-case damage allowed by 230.95(A) (91,260 kW-cycles). See Figure 1.

Worst Case Equipment Damage with 50 kA Available Fault Current

As allowed by 230.95(A). The IEEE 1584-2018 minimum arcing current is 25.98kA. Using the maximum 230.95(A) opening time of 60 cycles, the equipment damage is (25.98 kA X 60 cycles X 100 arcing volts) = 155,880 kW-cycles. See Figure 1.

As allowed by Proposed Exception No. 4. The IEEE 1584-2018 minimum arcing current is 25.98kA. Assuming an opening time of 4.2 cycles for 240.67(B), the equipment damage is (25.98 kA X 4.2 cycles X 100 arcing volts) = 10,912 kW-cycles. Assuming an opening time of 7 cycles for 240.67(B)(1) and (B)(3), the equipment damage is (25.98 kA X 7 cycles X 100 arcing volts) = 18,186 kW-cycles. Assuming an opening time of 1/2 cycle for 240.67(B)(4), the equipment damage is (25.98 kA X 0.5 cycles X 100 arcing volts) = 1,299 kW-cycles. Worst-case damage for the minimum arcing current with this proposed exception for fusible switches (18,186 kW-cycles) is less than 12% of the worst-case damage allowed by 230.95(A) (155,880 kW-cycles). See Figure 1.

As allowed by Proposed Exception No. 5. The IEEE 1584-2018 minimum arcing current is 25.98kA. Assuming an opening time of 4 cycles for 240.87(B)(1), (B)(2), or (B)(4), the equipment damage is (25.98 kA X 4 cycles X 100 arcing volts) = 10,392 kW-cycles. Assuming an opening time of 3 cycles for 240.87(B)(5) or (B)(6), the equipment damage is (25.98 kA X 3 cycles X 100 arcing volts) = 7,794 kW-cycles. Worst-case damage for the minimum arcing current with this proposed exception for circuit breakers (10,392 KW-Cycles) is less than 7% of the worst-case damage allowed by 230.95(A) (155,880 kW-cycles). See Figure 1.

Worst Case Equipment Damage with 100 kA Available Fault Current

As allowed by 230.95(A). For an available fault current of 100kA, the IEEE 1584-2018 three phase minimum arcing current is 33.75 kA. Using the maximum 230.95(A) opening time of 60 cycles, the equipment damage is (33.75 kA X 60 cycles X 100 arcing volts) = 202,500 kW-cycles. See Figure 1.

As allowed by Proposed Exception No. 4. The IEEE 1584-2018 minimum arcing current is 33.75 kA. Assuming the maximum opening time of 4.2 cycles (0.07 seconds) for 240.67(B), the equipment damage is 33.75 kA X 4.2 cycles X 100 arcing volts) = 14,175 kW-cycles. Assuming an opening time of 7 cycles for 240.67(B)(1) and (B)(3), the equipment damage is (33.75 kA X 7 cycles X 100 arcing volts = 23625 kW-cycles. Assuming an opening time of 1/2 cycle for 240.67(B)(4), the equipment damage is (33.75 kA X 0.5 cycles X 100 arcing volts) = 1688 kW-cycles. Worst-case damage for the minimum arcing current with this proposed exception for fusible switches (23625 kW-cycles) is less than 12% of the worst-case damage allowed by 230.95(A) (202,500 kW-cycles). See Figure 1.

As allowed by Proposed Exception No. 5. For an available fault current of 100kA, the IEEE 1584-2018 minimum arcing current is 33.75 kA. Assuming an opening time of 4 cycles for 240.87(B)(1), (B)(2), or (B)(4), the equipment damage is (33.75 kA X 4.0 cycles X 100 arcing volts) = 13,500 kW-cycles. Assuming an opening time of 3 cycles for 240.87(B)(5) or (B)(6), the equipment damage is (33.75 kA X 3 cycles X 100 arcing volts) = 10,125 kW-cycles. Worst-case damage for the minimum arcing current with this proposed exception for circuit breakers (13,500 KW-Cycles) is less than 7% of the worst-case damage allowed by 230.95(A) (202,500 kW-cycles). See Figure 1

Figure 1 (See attached file)
Figures 1 shows that equipment damage allowed by this Public Input is always, from 10,000 amperes available through 100,000 amperes available, just a small fraction of the equipment damage allowed by 230.95(A).

One might ask whether it is possible that the alternate systems proposed by this Public Input could be set such that they might provide arc energy reduction, but not operate during a lower level ground fault where traditional GFPE will provide protection. That question is answered by the very last lines of the proposed new language for both fusible switches and circuit breakers, as both the fusible switches and circuit breakers must be “set to operate at the lower of the calculated minimum arcing current or 38% of the available fault current.” Since we know the minimum three phase arcing current from IEEE 1584-2018 and the minimum sustainable phase to ground arcing current of 38% of the available fault current, we know whether or not the fusible switch or circuit breaker is set to operate at those values. So, there is no minimum value of actual arcing current that could be so small as to be picked up by 230.95(A) requirements that would not also be sensed by the requirements of Exceptions 4 and 5.

Let’s look at an example with 10,000 available short-circuit amperes (lowest available fault current for which Exceptions 4 and 5 could apply). In this case the minimum 1584-2018 three-phase arcing current is 6.09 kA and the minimum sustainable phase-to-ground current is 38% of 10,000 amps = 3.8 kA. Per the requirements of the proposed exceptions the fusible switch or circuit breaker must be set to operate at the lower of either 6.09 kA or 3.8 kA, so the fusible switch or circuit breaker must operate for arcing currents of 3.8 kA or greater. If a three phase arcing fault occurs it is calculated to be 6.09 kA with the possibility that a single phase to ground arcing fault could be as low as 3.8 kA. In either case, the requirements of Exceptions 4 and 5 assure that the arcing fault is taken off-line in no more than 7 cycles for Exception 4 and no more than 4 cycles for Exception 5, while 230.95(A) would allow a full 60 cycles.
What happens if the available fault current is less than or even significantly less than 10,000 amperes? Then the proposed Exceptions 4 and 5 do not apply and GFPE would be required.

Energy reducing maintenance switches (240.67(B)(2) and 240.87(B)(3)) are not included in the exceptions because energy-reducing maintenance switches are typically turned off when a worker is not working on energized equipment, whereas ground fault protection is constantly protecting the equipment, whether or not a worker is working on the energized equipment.

The Approved Equivalent Means (240.67(B)(5) and 240.87(B)(7)) are excluded because the opening times for these methods are unclear.

Key Benefit:

While GFPE can often be set as low as 200 amperes, because of numerous nuisance GFPE openings, in some cases even for ground faults in 277-volt lighting circuits, it has become common for plant electricians, plant engineers, consulting engineers, and electrical contractors to set GFPE at the maximum settings. That has solved a portion of the nuisance tripping problem, but even set at the maximum, it is often difficult to selectively coordinate it (GFPE) with sub-feeder or branch circuit phase overcurrent protective devices of 400 amperes or greater. So, for example, even with a feeder GFPE set at the 230.95(A) maximum, a ground fault on a 500 kcmil sub-feeder or branch circuit will typically take out the GFPE on the feeder, blacking out the entire feeder. With Exceptions 4 and 5, the GFPE is no longer required. The equipment is still protected (even better protected) and the entire feeder is not subjected to a nuisance blackout because of a ground fault on a sub-feeder or branch circuit. The key benefit of this Public Input is that when these alternate methods are utilized, it provides the consulting engineer or design-build contractor with the ability to provide even better arcing fault protection for the equipment and the ability to much more easily meet the selective coordination requirements of 240.11, 700.32, 701.32, and 708.54.

Conclusion:

This Public Input takes advantage of the arc-energy reduction requirements found in 240.67 and 240.87. It provides an exception for GFPE requirements whenever specific 240.67 and 240.87 methods to reduce clearing time are utilized. Arc energy reduction methods, as detailed in Exceptions 4 and 5, must open for “all” actual arcing ground faults and in a much faster time than allowed by 230.95(A). Reviewing Figure 1, it becomes obvious that Exceptions 4 and 5 will limit the arcing fault damage to the equipment to a level that is considerably less than that currently allowed by the requirements found in 230.95(A).

Submitter Information Verification

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Submittal Date: Thu Jul 27 15:39:50 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: Even with the limitations proposed in the new exceptions, the arc energy reduction technologies may not operate above the pickup current levels specified in 230.95(A), but below the minimum arcing current. Ground-fault currents may exist in this range, and the arc energy reduction technology may not operate on this current unless the resulting damage to equipment leads to a higher current arcing fault. Additionally, differential relaying and energy-reducing active arc-flash mitigation system options would not protect any downstream conductors or equipment, and only provide protection within the equipment boundary. This may ultimately reduce the level of protection currently provided by GFPE, or by a combination of GFPE and arc energy reduction technology, as applicable.

215.10 Ground-Fault Protection of Equipment.

Each feeder disconnect rated 1000 amperes or more and installed on solidly grounded wye electrical systems of more than 150 volts to ground, but not exceeding 1000 volts phase-to- phase, shall be provided with ground-fault protection of equipment in accordance with 230.95.

Informational Note: See 517.17 for buildings that contain health care occupancies.

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

Exception No. 2: This section shall not apply if ground-fault protection of equipment is provided on the supply side of the feeder and on the load side of any transformer supplying the feeder.

Exception No. 3: If temporary feeder conductors are used to connect a generator to a facility for repair, maintenance, or emergencies, ground-fault protection of equipment shall not be required. Temporary feeders without ground-fault protection shall be permitted for the time period necessary but shall not exceed 90 days.

Exception No. 4: For fused disconnects, where the available fault current, at the fused disconnect, is 10,000 amperes or greater, the ground-fault protection provisions of this section shall not apply if the fuses have a clearing time of 0.07 seconds or less at the lower of the calculated minimum available arcing current or 38% of the available fault current or if the disconnect switch complies with Section 240.67(B)(1), 240.67(B)(3), or 240.67(B)(4). and is set to operate at the lower of the calculated minimum arcing current or 38% of the available fault current.

Exception No. 5: For circuit breakers, where the available fault current, at the circuit breaker, is 10,000 amperes or greater, the ground-fault protection provisions of this section shall not apply if the circuit breaker complies with Section 240.87(B)(2), 240.87(B)(4), 240.87(B)(5), or 240.87(B)(6). and is set to operate at the lower of the calculated minimum arcing current or 38% of the available fault current.

Substantiation

Executive Summary: We can now accurately predict the minimum three-phase arcing current, along with the minimum sustainable line-to-ground arcing current, for an arcing ground fault. Knowing these currents, we can determine whether or not the arc energy reduction methods in proposed Exceptions 4 and 5 will operate at, or below, those levels. If they do operate at or below those levels, the equipment damage will be just a small percentage of that allowed by the GFPE requirements of 230.95. This applies to all available fault currents of 10,000 amperes or greater.

Background: A requirement (230.95) for ground fault protection of equipment (GFPE) was added to the 1971 NEC® because 480/277 volt, solidly grounded wye services, protected by 1000 ampere and larger overcurrent protective devices, were burning down due to arcing ground faults. 208/120 volt services and those services protected by smaller overcurrent protective devices were not burning down, so they weren't included in the new GFPE requirement. Over many Code cycles, GFPE requirements were also added for branch circuits (210.13), feeders (215.10), and equipment (240.13). In all cases, the intent was to limit, not eliminate, damage to the switchboard, switchgear, panelboard or equipment being supplied by the 1000 ampere and larger overcurrent protective device.

Present Day: The electrical industry has evolved considerably since those early GFPE requirements were introduced. In those years, J. R. Dunki-Jacobs, Harris I. Stanback, and R. H. Kaufman authored numerous ground-breaking papers on arcing ground faults and the need for ground fault protection. They accomplished a great deal and their determination that the minimum sustainable line-to-ground arcing fault on a 480/277 volt system was 38% of the available bolted fault current is very close to the values predicted today by IEEE1584-2019. In recent editions of the NEC®, Sections were added to require the protection of an employee that is exposed to dangerous levels of incident energy while working on energized equipment. To avoid serious injuries, employees, working on or near energized equipment, can only withstand a small fraction of the incident energy to which equipment may be subjected by the allowances of 230.95(A). This substantiation compares the levels of equipment damage allowed by existing 230.95(A) with the levels allowed by the employee arc-flash protection requirements of 240.67 and 240.87. It shows that the equipment damage allowed by the employee arc-flash protection requirements of 240.67 and 240.87 is just a small fraction of that allowed by 230.95(A). The following examples utilize IEEE 1584-2018 for a 480 volt arcing fault with 32mm equipment spacing, in a 20”x20”x20” box and an HCB (horizontal conductors in a metal enclosure) configuration. Equipment damage is described in terms of kW-cycles which is a product of arcing current (kA) X number of arcing cycles (cycles) X arc voltage (100 volts on a 480 system).

Worst Case Equipment Damage with 10 kA Available Fault Current

As allowed by 230.95(A). The IEEE 1584-2018 minimum arcing current is 6.09kA. Using the maximum 230.95(A) opening time of 60 cycles, the equipment damage is (6.09 kA X 60 cycles X 100 arcing volts) = 36,540 kW-cycles. See Figure 1.

As allowed by Proposed Exception No. 4. The IEEE 1584-2018 minimum arcing current is 6.09kA. Assuming the maximum opening time of 4.2 cycles (0.07 seconds) for 240.67(B), the equipment damage is 6.09 kA X 4.2 cycles X 100 arcing volts) = 2,558 kW-cycles. Assuming an opening time of 7 cycles for 240.67(B)(1) and (B)(3), the equipment damage is (6.09 kA X 7 cycles X 100 arcing volts = 4,263 kW-cycles. Assuming an opening time of 1/2 cycle for 240.67(B)(4), the equipment damage is (6.09 kA X 0.5 cycles X 100 arcing volts) = 305 kW-cycles. Worst-case damage for the minimum arcing current with this proposed exception for fusible switches (4,263 kW-cycles) is less than 12% of the worst-case damage allowed by 230.95(A) (36,540 kW-cycles). See Figure 1.

As allowed by Proposed Exception No. 5. The IEEE 1584-2018 minimum arcing current is 6.09kA. Assuming an opening time of 4 cycles for 240.87(B)(1), (B)(2), or (B)(4), the equipment damage is (6.09 kA X 4.0 cycles X 100 arcing volts) = 2,436 kW-cycles. Assuming an opening time of 3 cycles for 240.87(B)(5) or (B)(6), the equipment damage is (6.09 kA X 3 cycles X 100 arcing volts) = 1,827 kW-cycles. Worst-case damage for the minimum arcing current with this proposed exception for circuit breakers (2,426 KW-Cycles) is less than 7% of the worst-case damage allowed by 230.95(A) (36,540 kW-cycles). See Figure 1.

Worst Case Equipment Damage with 25 kA Available Fault Current

As allowed by 230.95(A). The IEEE 1584-2018 minimum arcing current is 15.21kA. Using the maximum 230.95(A) opening time of 60 cycles, the equipment damage is (15.21 kA X 60 cycles X 100 arcing volts) = 91,260 kW-cycles. See Figure 1.

As allowed by Proposed Exception No. 4. The IEEE 1584-2018 minimum arcing current is 15.21kA. Assuming the maximum opening time of 4.2 cycles for 240.67(B), the equipment damage is (15.21 kA X 4.2 cycles X 100 arcing volts) = 6,388 kW-cycles. Assuming an opening time of 7 cycles for 240.67(B)(1) and (B)(3), the equipment damage is (15.21 kA X 7 cycles X 100 arcing volts) = 10,647 kW-cycles. Assuming an opening time of 1/2 cycle for 240.67(B)(4), the equipment damage is (15.21 kA X 0.5 cycles X 100 arcing volts) = 761 kW-cycles. Worst-case damage for the minimum arcing current with this proposed exception for fusible switches (10,647 kW-cycles) is less than 12% of the worst-case damage allowed by 230.95(A) (91,260 kW-cycles). See Figure 1.

As allowed by Proposed Exception No. 5. The IEEE 1584-2018 minimum arcing current is 15.21kA. Assuming an opening time of 4 cycles for 240.87(B)(1), (B)(2), or (B)(4), the equipment damage is (15.21 kA X 4 cycles X 100 arcing volts) = 6,084 kW-cycles. Assuming an opening time of 3 cycles for 240.87(B)(5) or (B)(6), the equipment damage is (15,21 kA X 3 cycles X 100 arcing volts) = 4,563 kW-cycles. Worst-case damage for the minimum arcing current with this proposed exception for circuit breakers (6,084 kW-Cycles) is less than 7% of the worst-case damage allowed by 230.95(A) (91,260 kW-cycles). See Figure 1.

Worst Case Equipment Damage with 50 kA Available Fault Current

As allowed by 230.95(A). The IEEE 1584-2018 minimum arcing current is 25.98kA. Using the maximum 230.95(A) opening time of 60 cycles, the equipment damage is (25.98 kA X 60 cycles X 100 arcing volts) = 155,880 kW- cycles. See Figure 1.

As allowed by Proposed Exception No. 4. The IEEE 1584-2018 minimum arcing current is 25.98kA. Assuming an opening time of 4.2 cycles for 240.67(B), the equipment damage is (25.98 kA X 4.2 cycles X 100 arcing volts) = 10,912 kW-cycles. Assuming an opening time of 7 cycles for 240.67(B)(1) and (B)(3), the equipment damage is (25.98 kA X 7 cycles X 100 arcing volts) = 18,186 kW-cycles. Assuming an opening time of 1/2 cycle for 240.67(B)(4), the equipment damage is (25.98 kA X 0.5 cycles X 100 arcing volts) = 1,299 kW-cycles. Worst-case damage for the minimum arcing current with this proposed exception for fusible switches (18,186 kW-cycles) is less than 12% of the worst-case damage allowed by 230.95(A) (155,880 kW-cycles). See Figure 1.

As allowed by Proposed Exception No. 5. The IEEE 1584-2018 minimum arcing current is 25.98kA. Assuming an opening time of 4 cycles for 240.87(B)(1), (B)(2), or (B)(4), the equipment damage is (25.98 kA X 4 cycles X 100 arcing volts) = 10,392 kW-cycles. Assuming an opening time of 3 cycles for 240.87(B)(5) or (B)(6), the equipment damage is (25.98 kA X 3 cycles X 100 arcing volts) = 7,794 kW-cycles. Worst-case damage for the minimum arcing current with this proposed exception for circuit breakers (10,392 KW-Cycles) is less than 7% of the worst-case damage allowed by 230.95(A) (155,880 kW-cycles). See Figure 1.

Worst Case Equipment Damage with 100 kA Available Fault Current

As allowed by 230.95(A). For an available fault current of 100kA, the IEEE 1584-2018 three phase minimum arcing current is 33.75 kA. Using the maximum 230.95(A) opening time of 60 cycles, the equipment damage is (33.75 kA X 60 cycles X 100 arcing volts) = 202,500 kW-cycles. See Figure 1.

As allowed by Proposed Exception No. 4. The IEEE 1584-2018 minimum arcing current is 33.75 kA. Assuming the maximum opening time of 4.2 cycles (0.07 seconds) for 240.67(B), the equipment damage is 33.75 kA X 4.2 cycles X 100 arcing volts) = 14,175 kW-cycles. Assuming an opening time of 7 cycles for 240.67(B)(1) and (B)(3), the equipment damage is (33.75 kA X 7 cycles X 100 arcing volts = 23625 kW-cycles. Assuming an opening time of 1/2 cycle for 240.67(B)(4), the equipment damage is (33.75 kA X 0.5 cycles X 100 arcing volts) = 1688 kW-cycles. Worst-case damage for the minimum arcing current with this proposed exception for fusible switches (23625 kW-cycles) is less than 12% of the worst-case damage allowed by 230.95(A) (202,500 kW-cycles). See Figure 1.

As allowed by Proposed Exception No. 5. For an available fault current of 100kA, the IEEE 1584-2018 minimum arcing current is 33.75 kA. Assuming an opening time of 4 cycles for 240.87(B)(1), (B)(2), or (B)(4), the equipment damage is (33.75 kA X 4.0 cycles X 100 arcing volts) = 13,500 kW-cycles. Assuming an opening time of 3 cycles for 240.87(B)(5) or (B)(6), the equipment damage is (33.75 kA X 3 cycles X 100 arcing volts) = 10,125 kW-cycles. Worst-case damage for the minimum arcing current with this proposed exception for circuit breakers (13,500 KW-Cycles) is less than 7% of the worst-case damage allowed by 230.95(A) (202,500 kW-cycles). See Figure 1

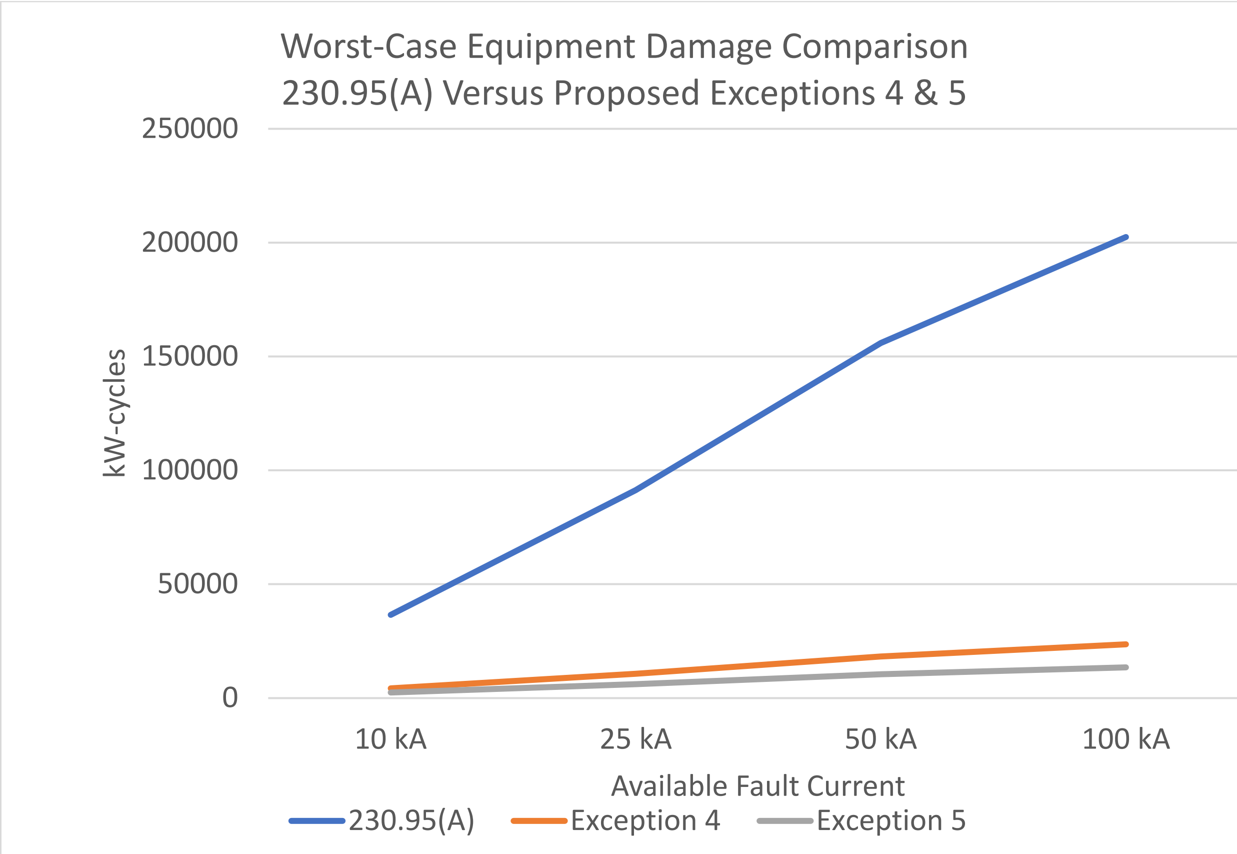

Figure 1

Figures 1 shows that equipment damage allowed by this Public Input is always, from 10,000 amperes available through 100,000 amperes available, just a small fraction of the equipment damage allowed by 230.95(A).

One might ask whether it is possible that the alternate systems proposed by this Public Input could be set such that they might provide arc energy reduction, but not operate during a lower level ground fault where traditional GFPE will provide protection. That question is answered by the very last lines of the proposed new language for both fusible switches and circuit breakers, as both the fusible switches and circuit breakers must be ***"set to operate at the lower of the calculated minimum arcing current or 38% of the available fault current."*** Since we know the minimum three phase arcing current from IEEE 1584-2018 and the minimum sustainable phase to ground arcing current of 38% of the available fault current, we know whether or not the fusible switch or circuit breaker is set to operate at those values. So, there is no minimum value of actual arcing current that could be so small as to be picked up by 230.95(A) requirements that would not also be sensed by the requirements of Exceptions 4 and 5.

Let's look at an example with 10,000 available short-circuit amperes (lowest available fault current for which Exceptions 4 and 5 could apply). In this case the minimum 1584-2018 three-phase arcing current is 6.09 kA and the minimum sustainable phase-to-ground current is 38% of 10,000 amps = 3.8 kA. Per the requirements of the proposed exceptions the fusible switch or circuit breaker must be set to operate at the lower of either 6.09 kA or 3.8 kA, so the fusible switch or circuit breaker must operate for arcing currents of 3.8 kA or greater. If a three phase arcing fault occurs it is calculated to be 6.09 kA with the possibility that a single phase to ground arcing fault could be as low as 3.8 kA. In either case, the requirements of Exceptions 4 and 5 assure that the arcing fault is taken off-line in no more than 7 cycles for Exception 4 and no more than 4 cycles for Exception 5, while 230.95(A) would allow a full 60 cycles.

What happens if the available fault current is less than or even significantly less than 10,000 amperes? Then the proposed Exceptions 4 and 5 do not apply and GFPE would be required.

Energy reducing maintenance switches (240.67(B)(2) and 240.87(B)(3)) are not included in the exceptions because energy-reducing maintenance switches are typically turned off when a worker is not working on energized equipment, whereas ground fault protection is constantly protecting the equipment, whether or not a worker is working on the energized equipment.

The Approved Equivalent Means (240.67(B)(5) and 240.87(B)(7)) are excluded because the opening times for these methods are unclear.

Key Benefit: While GFPE can often be set as low as 200 amperes, because of numerous nuisance GFPE openings, in some cases even for ground faults in 277-volt lighting circuits, it has become common for plant electricians, plant engineers, consulting engineers, and electrical contractors to set GFPE at the maximum settings. That has solved a portion of the nuisance tripping problem, but even set at the maximum, it is often difficult to selectively coordinate it (GFPE) with sub-feeder or branch circuit phase overcurrent protective devices of 400 amperes or greater. So, for example, even with a feeder GFPE set at the 230.95(A) maximum, a ground fault on a 500 kcmil sub-feeder or branch circuit will typically take out the GFPE on the feeder, blacking out the entire feeder. With Exceptions 4 and 5, the GFPE is no longer required. The equipment is still protected (even better protected) and the entire feeder is not subjected to a nuisance blackout because of a ground fault on a sub-feeder or branch circuit. The key benefit of this Public Input is that when these alternate methods are utilized, it provides the consulting engineer or design-build contractor with the ability to provide even better arcing fault protection for the equipment and the ability to much more easily meet the selective coordination requirements of 240.11, 700.32, 701.32, and 708.54.

Conclusion: This Public Input takes advantage of the arc-energy reduction requirements found in 240.67 and 240.87. It provides an exception for GFPE requirements whenever specific 240.67 and 240.87 methods to reduce clearing time are utilized. Arc energy reduction methods, as detailed in Exceptions 4 and 5, must open for **“all”** actual arcing ground faults and in a much faster time than allowed by 230.95(A). Reviewing Figure 1, it becomes obvious that Exceptions 4 and 5 will limit the arcing fault damage to the equipment to a level that is considerably less than that currently allowed by the requirements found in 230.95(A).

Public Input No. 2001-NFPA 70-2023 [Section No. 215.10]

215.10 Ground-Fault Protection of Equipment.

Each feeder disconnect rated 1000 amperes or more and installed on solidly grounded wye electrical systems of more than 150 volts to ground, but not exceeding 1000 volts phase-to-phase, shall be provided with ground-fault protection of equipment in accordance with 230.95.

Informational Note: See 517.17 for buildings that contain health care occupancies.

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

Exception No. 2: This section shall not apply if ground-fault protection of equipment is provided on the supply side of the feeder and on the load side of any transformer supplying the feeder.

Exception No. 3: If temporary feeder conductors are used to connect a generator to a facility for repair, maintenance, or emergencies, ground-fault protection of equipment shall not be required. Temporary feeders without ground-fault protection shall be permitted for the time period necessary but shall not exceed 90 days.

Exception No. 4: For buildings supplied from an outdoor feeder per Article 225 Part II, this requirement shall apply to the building or structure disconnect required in 225.31.

Statement of Problem and Substantiation for Public Input

This proposed change clarifies that the requirements of 215.10 do not apply to feeders between an outdoor power source and the disconnect serving as the building or structure disconnect. This would harmonize the requirements for ground-fault protection of equipment for outdoor feeders supplying buildings or structures and the requirements for service conductors, which do not require ground fault protection outside of the building or structure. Customer-owned substations can be a significant distance from the building or structure supplied, and the building or structure disconnect is a more practical location for applying requirements for ground-fault protection of equipment.

Submitter Information Verification

Submitter Full Name: Bill Brown
Organization: Schneider Electric
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 10 15:28:16 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: It is not clear the proposed language is addressing the submitters intent and needs further substantiation to clarify the intended action to be achieved.

Public Input No. 4279-NFPA 70-2023 [Section No. 215.10]

215.10 Ground-Fault Protection of Equipment.

(A) AC Systems.

Each feeder disconnect rated 1000 amperes or more and installed on solidly grounded wye electrical systems of more than 150 volts to ground, but not exceeding 1000 volts phase-to-phase, shall be provided with ground-fault protection of equipment in accordance with 230.95.

(B) DC Systems.

Each feeder disconnect rated 1000 amperes or more and installed on solidly grounded dc electrical systems of more than 150 volts to ground, but not exceeding 1500 volts dc line-to-line, shall be provided with ground-fault protection of equipment in accordance with 230.95 .

Informational Note:

~~See~~

See 517.17 for buildings that contain health care occupancies.

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

Exception No. 2: This section shall not apply if ground-fault protection of equipment is provided on the supply side of the feeder and on the load side of any transformer supplying the feeder.

Exception No. 3: If temporary feeder conductors are used to connect a generator to a facility for repair, maintenance, or emergencies, ground-fault protection of equipment shall not be required. Temporary feeders without ground-fault protection shall be permitted for the time period necessary but shall not exceed 90 days.

Statement of Problem and Substantiation for Public Input

This Public Input is submitted on behalf of a Correlating Committee DC Task Group consisting of Danish Zia, Jason Fisher, Randy Dollar, Larry Wildermuth, Scott Higgins, Scott Harding, Mark Earley, Jason Hopkins, Christopher Vance, Chad Kennedy and Derrick Atkins. This Public Input, along with other Public Inputs, was developed with the goal of improving usability and accuracy on requirements associated with DC circuits.

DC residential and commercial installations are emerging in the electrical infrastructure and are expected to be a growing alternative to the traditional AC only utility fed building. Examples include the US DOE Grid-interactive Efficient Buildings project (Note 1), the Purdue University RENEWW house (Note 2), and a DC Microgrid community in Vermont (Note 3). These installations may involve buildings that are distributed entirely with DC, or with an AC/DC hybrid distribution.

The requirements of Section 215.10 address ground-faults on equipment which could propagate into a larger arcing fault, potentially causing significant loss of property and life. However, the requirements of Section 215.10 and related sections are currently limited to solidly grounded wye AC circuits only. The hazards addressed by this type of protection also exist in grounded DC circuits, and a resulting arcing fault may be more severe due to a lack of zero cross-over in DC waveforms. As there is continued expansion of DC throughout the infrastructure it is necessary to ensure that the same level of protection is provided. This proposal closes a gap in the Code for DC circuits where similar hazards exist but ground-fault protection of equipment may not be provided.

Note 1 - https://www.energy.gov/sites/default/files/2020/09/f79/bto-geb-project-summary-093020.pdf
Note 2 - https://engineering.purdue.edu/ME/News/2022/purdue-house-runs-entirely-on-dc-power
Note 3 - https://www.efficiencyvermont.com/Media/Default/docs/white-papers/Energy_Resilience.pdf

Additional Note - The informational note is already existing and is incorrectly highlighted as a change by TerraView.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 4280-NFPA 70-2023 [Section No. 230.95]	
Public Input No. 4283-NFPA 70-2023 [Section No. 240.13]	

Public Input No. 4280-NFPA 70-2023 [Section No. 230.95]
Public Input No. 4283-NFPA 70-2023 [Section No. 240.13]

Submitter Information Verification

Submitter Full Name: Danish Zia
Organization: UL Solutions
Street Address:
City:
State:
Zip:
Submittal Date: Thu Sep 07 09:20:55 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9007-NFPA 70-2024
Statement: The committee is including DC in 215.10(B) to ensure the hazards for arcing faults are also addressed in DC systems from 150V to ground up to 1500V line-to-line.

Public Input No. 3061-NFPA 70-2023 [Section No. 215.12(C)]

(C) Identification of Ungrounded Conductors.

Ungrounded conductors shall be identified in accordance with 215.12(C)(1) ~~or~~ through (C)(~~2~~ 3), as applicable.

(1) Feeders Supplied from One Nominal Voltage System.

If the premises wiring system has feeders supplied from one voltage system, feeder ungrounded conductors shall be identified in accordance with 310.6(C).

(2) 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 215.12(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~~ 3) Feeders Supplied from Direct-Current Systems.

Where a feeder is supplied from a dc system operating at more than 60 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 215.12(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:

(2) A continuous red outer finish

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

(4) 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)

(5) 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

(f) *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:

(7) A continuous black outer finish

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

(9) 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)

(10) 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

Statement of Problem and Substantiation for Public Input

Adding new second level subdivision to give Code users the knowledge on how to identify feeders supplied from a single nominal voltage system. 310.6(C) provides the requirements on how to properly identify ungrounded conductors from one nominal voltage system by simply having a finish that is distinguishable from grounded conductors or equipment grounding conductors. Re-numbered the following first level subdivisions with no technical change to comply with the NEC Style Manual.

Submitter Information Verification

Submitter Full Name:	Mike Holt
Organization:	Mike Holt Enterprises Inc
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Tue Aug 29 09:59:02 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: This requirement already exists in 200.6 and the proposed revision does not enhance the usability of the NEC.

Public Input No. 2508-NFPA 70-2023 [Section No. 215.12(C)(1)]

(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 nominal voltage system at all termination, connection, and splice points in compliance with 215.12(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.

Statement of Problem and Substantiation for Public Input

This simply changes the text to match that found in 210.5(C).

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Self-employed
Street Address:
City:
State:
Zip:
Submittal Date: Fri Aug 18 13:35:49 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9011-NFPA 70-2024

Statement: The language is revised to remove feeder as this section already address feeder in the scope of the article and clarifies the language requested by the submitter. The language is revised to provide clarification as to the nominal voltage of the system in the sentence and also aligns with the language found in 210.5(C)(1).

Public Input No. 783-NFPA 70-2023 [Section No. 215.12(C)(1)]

(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 215.12(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 enclosed 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.

Statement of Problem and Substantiation for Public Input

The word "enclosed" is added to make the requirement technically correct. The word "within" in the existing requirement literally requires the panelboard (a defined term that does not require it be within something) be within something. Also see the definition of "enclosed panelboard."

Submitter Information Verification

Submitter Full Name: Palmer Hickman
Organization: Electrical Training Alliance
Street Address:
City:
State:
Zip:
Submittal Date: Tue May 09 16:47:38 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9011-NFPA 70-2024

Statement: The language is revised to remove feeder as this section already address feeder in the scope of the article and clarifies the language requested by the submitter. The language is revised to provide clarification as to the nominal voltage of the system in the sentence and also aligns with the language found in 210.5(C)(1).

Public Input No. 784-NFPA 70-2023 [Section No. 215.12(C)(2)]

(2) Feeders Supplied from Direct-Current Systems.

Where a feeder is supplied from a dc system operating at more than 60 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 215.12(C)(2)(a) and (C)(2)(b). The identification methods utilized for conductors originating within each enclosed 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:

(2) A continuous red outer finish

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

(4) 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)

(5) 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

(f) *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:

(7) A continuous black outer finish

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

(9) 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)

(10) 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

Statement of Problem and Substantiation for Public Input

The only recommendation is to add the word "enclosed." It appears that Terra may have indicated more. The word "enclosed" is added to make the requirement technically correct. The word "within" in the existing requirement literally requires the panelboard (a defined term that does not require it be within something) be within something. Also see the definition of "enclosed panelboard."

Submitter Information Verification

Submitter Full Name: Palmer Hickman

Organization: Electrical Training Alliance

Street Address:

City:

State:

Zip:

Submittal Date: Tue May 09 16:51:11 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: FR-9013-NFPA 70-2024

Statement: The language is revised to remove feeder as this section already address feeder in the scope of the article and clarifies the language requested by the submitter.

Public Input No. 1338-NFPA 70-2023 [Section No. 215.15]

215.15 Barriers.

Barriers shall be placed such that no energized, 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) when the disconnecting device, to which the ~~tap~~ conductors are terminated, is in the open position.

Statement of Problem and Substantiation for Public Input

The word "Tap" is being removed as it is not necessary and causes confusion. The language of 215.15 is clear in speaking to transformer secondary conductors and tap conductors leaving this final use of the word "tap" to describe both of these conductors as not necessary.

Submitter Information Verification

Submitter Full Name: Thomas Domitrovich
Organization: Eaton Corporation
Street Address:
City:
State:
Zip:
Submittal Date: Sat Jul 08 12:30:36 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9015-NFPA 70-2024

Statement: The word “tap” is removed to address useability and concerns with correlation of the terms being used in 215.15. The secondary conductors may or may not be a tap conductor and the revised language clarifies this.

Public Input No. 1606-NFPA 70-2023 [Section No. 215.15]

215.15 Barriers.

Barriers shall be placed such that no energized, 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) when the disconnecting device, to which the tap conductors are terminated, is in the open position.

Additional Proposed Changes

File Name	Description	Approved
TIA_1655_70_23_4.pdf	NEC TIA 23-4 Log 1655	

Statement of Problem and Substantiation for Public Input

NOTE: This public input originates from Tentative Interim Amendment No. 23-4 (Log 1655) issued by the Standards Council on August 12, 2022 and per the NFPA Regs., needs to be reconsidered by the Code-Making Panel for the next edition of the Document.

Substantiation: The current language in Section 215.15 does not identify that the need to barrier is on energized uninsulated, ungrounded busbar or terminals and hence this could be interpreted that any uninsulated ungrounded busbar or terminal in a panelboard, switchboard, switchgear, or motor control center supplied by feeder taps or transformer secondary conductors would need to have a barrier in place. Adding the word “energized” makes this requirement clear.

Emergency Nature: The standard contains an error or an omission that was overlooked during the regular revision process.

Without making this change, the literal interpretation of this section is such that it would be required to place barriers in areas not intended by the requirement. The intent in this section is to only provide a barrier on those exposed parts that are energized when the main OCPD is in the open position. Without this language, the mere fact that no possible solution exists would lead to this section not being enforced exposing electrical workers to a shock hazard that this was supposed to address.

Submitter Information Verification

Submitter Full Name: CMP ON NEC-P10
Organization: Code Making Panel 10
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jul 27 11:12:59 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The code panel reaffirms its action on TIA 1655 to include the word “energized”.

Tentative Interim Amendment

NFPA® 70®

National Electrical Code®

2023 Edition

Reference: 215.15
TIA 23-4
(SC 22-8-18 / TIA Log #1655)

Note: Text of the TIA was issued and approved for incorporation into the document prior to printing.

1. Revise paragraph 215.15 to read as follows:

215.15 Barriers. Barriers shall be placed such that no <u>energized,</u> 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) when the disconnecting device, to which the tap conductors are terminated, is in the open position.

Issue Date: August 12, 2022

Effective Date: September 1, 2022

(Note: For further information on NFPA Codes and Standards, please see www.nfpa.org/docinfo)

Public Input No. 3648-NFPA 70-2023 [Section No. 215.15]

215.15 Barriers.

(1) Feeder Taps. Barriers shall be placed such that no energized, 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) when the disconnecting device, to which the tap conductors are terminated, is in the open position.

(2) Transformer Secondary Conductors. Barriers shall be placed such that no energized, 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 transformer secondary conductors in 240.21(C) when the disconnecting device, to which the ~~tap~~ secondary conductors are terminated, is in the open position.

Statement of Problem and Substantiation for Public Input

Breaking up 215.15 into a list item format to facilitate understanding for Code users. In accordance with NFPA Style Manual section 3.5.1.2 additional subdivisions shall be used where multiple requirements can be broken into independent requirements.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Tue Sep 05 12:09:54 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The additional language may create confusion. See proposed revision in separate action on 215.15 that should provide clarification for when barriers are required.

Public Input No. 518-NFPA 70-2023 [Section No. 215.15]

215.15 Barriers.

Barriers shall be placed such that no energized, 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 tap conductors in 240.21(C) when the disconnecting device, to which the tap conductors are terminated, is in the open position.

Statement of Problem and Substantiation for Public Input

The conductors addressed by 240.21(B) are clearly tap conductors since the title of that first level subdivision is "feeder taps." Some have argued that the "transformer secondary conductors" in 240.21(C) are also taps conductors. While this may be the case, the way the requirement is written seems to imply that "transformer secondary conductors" addressed in 240.21(C) are not tap conductors since they are not called "tap conductors." This recommendation is an attempt to have the Code Panel add additional clarity to this requirement to clarify whether or not the conductors addressed in 240.21(C) are, in fact, tap conductors. A related Public Input is being submitted to add "Tap" to the title of 240.21(C) to correlate the use of the term if those conductors addressed there are, in fact, tap conductors. This is a companion Public Input to one submitted to 240.21(C) to attempt to correlate the use of the term "tap conductor." The related Public Input should be PI-519.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 519-NFPA 70-2023 [Section No. 240.21(C)]	Related concept for correlation and clarity.
Public Input No. 519-NFPA 70-2023 [Section No. 240.21(C)]	

Submitter Information Verification

Submitter Full Name: Palmer Hickman
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Submittal Date: Mon Mar 27 17:43:02 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9015-NFPA 70-2024

Statement: The word “tap” is removed to address useability and concerns with correlation of the terms being used in 215.15. The secondary conductors may or may not be a tap conductor and the revised language clarifies this.

Public Input No. 4404-NFPA 70-2023 [Section No. 215.18]

215.18 Surge Protection, 1000 Volts or Less .

(A) Surge-Protective Device.

Where a feeder supplies any of the following, a listed surge-protective device (SPD) shall be installed:

(1) Dwelling units

(2) Dormitory units

(3) Guest rooms and guest suites of hotels and motels

(4) Areas of nursing homes and limited-care facilities used exclusively as patient sleeping rooms

(B) Location.

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

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.

(C) Type.

The SPD shall be a Type 1 or Type 2 SPD.

(D) Replacement.

Where the distribution equipment supplied by the feeder is replaced, all of the requirements of this section shall apply.

(E) Ratings.

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

Statement of Problem and Substantiation for Public Input

The surge protective device is required to be installed by 215.18(A), but the user must refer to Article 242 to find the requirement that the installed device be listed if it is 1000 volts or less. Other equipment and devices required in Chapter 2 such as ground-fault circuit-interrupters, arc-fault circuit interrupters, and wall-mounted control devices for required lighting outlets state listing requirements in the section that states the equipment or device is required to be installed. This change would fit with the style of other requirements and allow the user to readily know that listing is a requirement for the installed SPD.

There is also a problem with this requirement if the feeder is over 1000 volts but not over 1500 volts dc nominal. These feeder circuits are now covered by the scope of Article 215 and 215.18(A) requires a surge protective device (SPD). However, Part III of Article 242 refers to the overvoltage protection for over 1000 volts as a Surge Arrester. Changing the Title of 215.18 to include 1000 volts or less as it reads in Article 242 would solve this discrepancy. If it is determined that there is a requirement to install surge protection for feeders over 1000 volts but not over 1500 volts dc nominal, it also would be necessary to add a new first level subdivision for feeders over 1000 volts but not over 1500 volts dc nominal because the existing 215.18(B), 215.18(C), and 215.18(E) also refer to the SPD.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 4395-NFPA 70-2023 [Section No. 225.42]	Same requirement in different article and needs similar revision
Public Input No. 4415-NFPA 70-2023 [Section No. 230.67]	Same requirement in different article and needs similar revision
Public Input No. 4415-NFPA 70-2023 [Section No. 230.67]	

Submitter Information Verification

Submitter Full Name: Nick Starks
Organization: Denver Joint Electrical Apprenticeship and Training Committee
Affiliation: IBEW Local 68
Street Address:
City:
State:
Zip:
Submittal Date: Thu Sep 07 14:27:54 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The scope of Article 215 is established within 215.1, and listing requirements are already established in 242.6.

Public Input No. 75-NFPA 70-2023 [Section No. 215.18]

215.18 Surge Protection.

(A) Surge-Protective Device.

Where a feeder supplies any of the following, a surge-protective device (SPD) shall be installed:

(1) Dwelling units

(2) Dormitory units

(3) Guest rooms and guest suites of hotels and motels

(4) Areas of nursing homes and limited-care facilities used exclusively as patient sleeping rooms

Informational Note: See 517.10 (B) (2) and 210.12(D)(2).

(B) Location.

~~The SPD~~ Type 2 SPDs shall be ~~installed in or adjacent to distribution equipment,~~ connected to the load side of the feeder ~~,~~ and shall be installed in or adjacent to distribution equipment that contains branch circuit overcurrent protective ~~device(s) that~~ devices that supply the locations specified in 215.18(A).

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

Exception: In lieu of required Type 2 SPDs, Type 1 SPDs shall be permitted to be connected on the supply side of the feeder disconnecting means and shall be an integral part of the feeder disconnecting means or shall be located immediately adjacent thereto.

(C) **SPD** Type.

The SPD shall be a listed Type ~~1 or~~ 2 SPD. A listed Type 1 SPD shall be permitted to be installed in lieu of a Type 2 SPD.

(D) Replacement.

Where the distribution equipment supplied by the feeder is replaced, all of the requirements of this section shall apply.

~~**(E)** Ratings.~~

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

Statement of Problem and Substantiation for Public Input

SUMMARY:
• These changes are needed for correlation. 2020 NEC® 90.1(B) / 2023 NEC® 90.2(B) "Adequacy": "This Code contains provisions that are CONSIDERED NECESSARY for SAFETY. ..." SPD Type 2 protection is the ESSENTIAL MANDATE to assure that protective electronic devices "such as fire alarm systems, IDCIs, GFCIs, AFCIs and smoke alarms" remain effective. In contrast, an SPD Type 1 protective device is designed for this circuit location as merely a PERMISSIVE ALTERNATIVE that goes beyond what's "considered necessary". Express it that way PERMISSIVELY! To clarify further, when Type 1 SPDs are installed at an SPD Type 1 (ARRESTOR) LOCATION, they are nowhere near this sensitive equipment to be protected.

• Again, these changes are needed for correlation. 2020 NEC® 90.1(A) / 2023 NEC® 90.2(A) "Practical Safeguarding": "... This Code is NOT intended as a DESIGN SPECIFICATION ...". Nominal discharge current rating is a performance specification, not a safety requirement, and must be left to the design specification!

• 2023 NEC® new 242.9 "Indicating" and published UL Standard UL 1449 already adequately require ACTUAL SPD STATUS INDICATION of CONTINUING FUNCTIONALITY of SPDs. Therefore, 2023 NEC® new 215.18(E) is poorly redundant to that end. The nominal discharge current DESIGN SPECIFICATION attempts to predict approximately the ENDURANCE LONGEVITY of the SPD and must NOT be used as a PREDICTIVE proxy for SPD CONTINUING FUNCTIONALITY better addressed by ACTUAL INDICATORS required elsewhere in the Code and in the product standard.

• Absolutely NO DATA whatsoever was PRESENTED to substantiate that any safety issue exists for LISTED Type 2

SPDs having a nominal discharge current rating of 3 kA or 5 kA and that Type 2 SPDs so rated inherently cannot adequately and safely protect the intended protective equipment connected to the load side of the feeder disconnect device. Fully capable LISTED Type 2 SPDs were unnecessarily excluded by 2023 NEC® 215.18(E), with no technical basis.

SPECIFICS:
• 2023 NEC® 215.18 for FEEDERS was a "copy-and-paste" extrapolation of NEC® 230.67 (for SERVICES). 2020 NEC® 230.67 was proposed by Public Input PI-2696-NFPA70-2017 [James Dollard for IBEW]. The intent of that Public Input is to assure that protective electronic devices "such as fire alarm systems, IDCIs, GFCIs, AFCIs and smoke alarms" would not be rendered ineffective due to transient overvoltage damage. As improperly worded in 230.67(C) by FR-8546-NFPA70-2018, the clarity of EXACTLY WHAT was being surge protected became unclear. The equipment to be surge protected is on the LOAD SIDE. There are no "fire alarm systems, IDCIs, GFCIs, AFCIs and smoke alarms" types of equipment installed on the SUPPLY SIDE. This information appears to have been omitted in the Substantiation of Public Input PI-2696-NFPA70-2017. This added 230.67 requirement and the 2023 NEC® 225.42 and 215.18 requirements that followed from 230.67 should have MANDATED SPD Type 2, with PERMISSIVE use of an SPD Type 1 in the service equipment as an allowed PERMISSIVE alternative. The NEC® sets essential to be based upon safety metrics. Performance mandate with no rationale should never be allowed. The added 230.67(E) requirement to include nominal discharge current for an SPD and the 2023 NEC® 225.42(E) and 215.18(E) requirements that followed from 230.67(E) are performance specifications, not safety requirements nor safety measurements. These nominal discharge current parameters must be left to the design specifications and engineering, in compliance with 2020 NEC® 90.1(B) / 2023 NEC® 90.2(B) "Adequacy" for ESSENTIAL safety requirements versus OPTIONAL design specifications.

• 2023 NEC® 215.18(B): CONNECTION LOCATION (in the circuit) is a distinct consideration from PHYSICAL ENCLOSURE-MOUNTING LOCATION. The revised wording was harmonized with appropriate wording from 242.14(A), "... connected anywhere on the load side of a service disconnect overcurrent device required by 230.91 unless installed in accordance with 230.82(8)".

• 2023 NEC® 215.18(E): Nominal discharge current rating is purely a performance specification, NOT a safety requirement, and should be left to the design specification, in compliance with 2020 NEC® 90.1(A) / 2023 NEC® 90.2(A).

• 2023 215.18(E): First Revision FR-7689-NFPA70-2020 extrapolated from Public Input PI-3722-NFPA70-2020 [Garret Wernecke of Raycap Inc.] of 230.67(E) wrongly conflated that the SPD specified in 2020 NEC® 230.67 served to protect the SUPPLY SIDE of the service equipment and consequently mandated the lowest value of nominal discharge current rating I(n) (cap-eye-sub-n) permitted to be UL 1449-listed for a Type 1 SPD of 10 kA. Rather than to assure those protective electronic devices on the LOAD SIDE of the service disconnect remained operational, the 230.67 mandate (and consequently new 215.18 and 225.42 mandates) was directed at the LINE SIDE where these "fire alarm system, IDCI, GFCI, AFCI and smoke alarm" protective devices are NOT installed.

These 230.67(E), 215.18(E) and 225.42(E) mandates ignored the entire purpose of an SPD from the UL Safety Standard UL 1449. A listed Type 2 SPDs CAN CONTINUE to have a nominal discharge current rating of a fully-listable 3 kA or 5 kA. This mandate misses the point of listed SPDs installed for generations that are still fully operational, with no reports of insufficient Nominal Discharge Current values.

• Absolutely no supporting data was provided for public review. To date, there is no technical data in support of Public Input PI-3722-NFPA70-2020 or First Revisions FR-8299-NFPA70-2020 and FR-7689-NFPA70-2020, or with any subsequent Public Comments thereto. In order to create a safety mandate as a U. S. national mandate, substantiation of a safety issue MUST be demonstrated. Listed Type 2 SPDs, with nominal discharge current ratings of 3 kA or 5 kA, and protecting equipment on the load side of the service disconnect overcurrent device has been accepted in 2017 (and earlier) NEC® Article 285 and is still being used with no consequences. UL has stated that it has seen no safety issues that would warrant withdrawal of continued listing of Type 2 SPDs with nominal discharge ratings of 3 kA or 5 kA. To mandate this nominal discharge current rating now and further to raise the mandated rating, documentation must be provided to show cause. There has still been no case presented to impose this mandate and to increase its value. (Please note that a nominal discharge current rating of 10 kA has nothing whatsoever to do with the common Short-Circuit Current Rating [SCCR] or Interrupting Rating of COINCIDENTALLY a 10 kA VALUE.)

• The Nominal Discharge Current I(n) attribute is being misrepresented. Nominal discharge current rating I(n) [cap-eye-sub-n] is being used in an attempt to establish the ENDURANCE LONGEVITY of the SPD. This is incorrect, as normal power system events will fail an SPD, regardless of the I(n) rating. It should not be used as a proxy for SPD CONTINUING FUNCTIONALITY or to incite the belief that higher I(n) ratings provide improved protection. SPDs are always selected by VOLTAGE as their function is voltage-dependent.

• Per UL Standard UL 1449 and 2023 NEC® new 242.9 "Indicating", added by Public Input PI-3740-NFPA70-2020 [Rudolph Garza of IAEI] and FR-7957-NFPA70-2020, "an SPD shall provide INDICATION that it is FUNCTIONING PROPERLY".

• 215.18(B) editorial: "device(s)" is contrary to NEC® Style Manual 3.3.3; revise to plural "devices" per NEC® Style

Manual 3.3.3.

• I serve on what is now the CSA Technical Subcommittee/Integrated Working Group for CSA-C22.2 No. 269-series CSA Standards for Surge Protective Devices from the 1990s to present, and have been involved in the product engineering of surge protective devices from the late 1970s to present through two employers (General Electric Company and Hubbell Incorporated).

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 46-NFPA 70-2023 [Section No. 230.67]	230.67 is the basis for 225.42 and 215.18 existing.
Public Input No. 58-NFPA 70-2023 [Section No. 225.42]	230.67 is the basis for 225.42 and 215.18 existing.
Public Input No. 46-NFPA 70-2023 [Section No. 230.67]	
Public Input No. 58-NFPA 70-2023 [Section No. 225.42]	

Submitter Information Verification

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Submittal Date: Sun Jan 08 19:28:41 EST 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9064-NFPA 70-2024

Statement: The informational note is not necessary. The language is (B) and (C) is correct as written.

Minimum I(n) requirements were added to the NEC in 2023 due to concerns that SPD status was unknown by NEC users. Data indicates that nearly all SPD failures are caused by temporary overvoltage (TOV) events. SPDs with increasing I(n) values fail in TOV events. Therefore requiring I(n) values has very little, if any impact on the number of SPDs of unknown status being active.

Additionally, I(n) is often mistaken for SCCR. This results in misapplication and coordination with system available fault current.

Further, U(p) values at higher I(n) values such as the currently mandated 10kA level exceed the immunity levels of life saving equipment such as GFCI's, AFCI's, and smoke detectors. This contradicts the original intent of mandating the use of SPDs in the NEC.

To this point, science and technology have not advanced enough to develop SPDs that can withstand TOV events, remain online, and provide U(p) levels adequate to provide equipment protection in TOV conditions. NEC users should follow manufacturers' maintenance guidelines in order to monitor SPD status.

Public Input No. 1306-NFPA 70-2023 [Section No. 215.18(A)]

(A) Surge-Protective Device.

~~Where a feeder supplies~~ Where feeders supply any of the following, ~~a~~ surge-protective ~~device~~ devices (~~SPD~~ SPDs) shall be installed:

(1) Dwelling units

(2) Dormitory units

(3) Guest rooms and guest suites of hotels and motels

(4) Areas of nursing homes and limited-care facilities used exclusively as patient sleeping rooms

(5) Rooms in educational facilities containing information technology equipment or other sensitive electronic equipment

(6) Rooms in buildings that contain sensitive electronic medical equipment

Additional Proposed Changes

File Name	Description	Approved
EPRI_-_MRI.pdf	SPD info on MRI	
ESFi_SPD_Awareness.pdf	ESFi SPD Awareness info	
ESFi_Understanding_SPD_Survey.pdf	ESFi SPD Survey	

Statement of Problem and Substantiation for Public Input

The addition of education and medical procedural and diagnostic centers to require surge protection is essential to provide surge protection of feeders supplying this sensitive electronic equipment. The loss of these medical devices and equipment creates issues related to taxpayer-funded areas and the safe diagnosis and treatment of medical conditions. The risk of failure of these types of equipment is identified and shown in a number of ESFI documents that are included. The substantiation of using feeders in protecting these areas is that the equipment is located in only certain areas of a building such as a computer classroom, teaching laboratories, medical laboratory, and medical and procedural diagnostic equipment such as an MRI or X-Ray equipment. There are insurance comments on the impact surges make: Attached below are supporting documentation and articles.

State Farm Simple Insights:
Can a power surge damage my electronics?

https://www.statefarm.com/simple-insights/residence/are-power-surges-damaging-your-electronics

An invisible culprit may be harming your devices. Learn how to protect your property.

AmTrust Financial Services:
How to Protect Your Business from Dangerous Power Surges

https://amtrustfinancial.com/blog/loss-control/business-power-surge-protection

Guardian Health
Protecting Medical Equipment from Faulty and Unreliable Electrical Power

https://www.gradianhealth.org/protecting-medical-equipment-from-faulty-and-unreliable-electrical-power/

Submitter Information Verification

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Organization: NEMA

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Submittal Date: Fri Jul 07 16:10:13 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9061-NFPA 70-2024

Statement: The revised language brings the terms in alignment with building code and other standards. The first sentence is revised to comply with the NEC Style Manual section 3.5.3.

Proposed item (5) from PI 1306 was not accepted as it does not include providing protection for safety devices in the infrastructure. Proposed item (6) from PI 1306 was not accepted as it is vague and not enforceable.

Item (5) from PI 3367 was accepted to align with the addition of 210.12(D)(3). Surge protection was included in the 2023 NEC to address the recognized need for surge protection to protect the sensitive electronics and systems found in safety devices (such as AFCI, GFCI and smoke alarms).

The Correlating Committee will need to review the use of the term "Dormitories" so it is applied uniformly across the NEC.

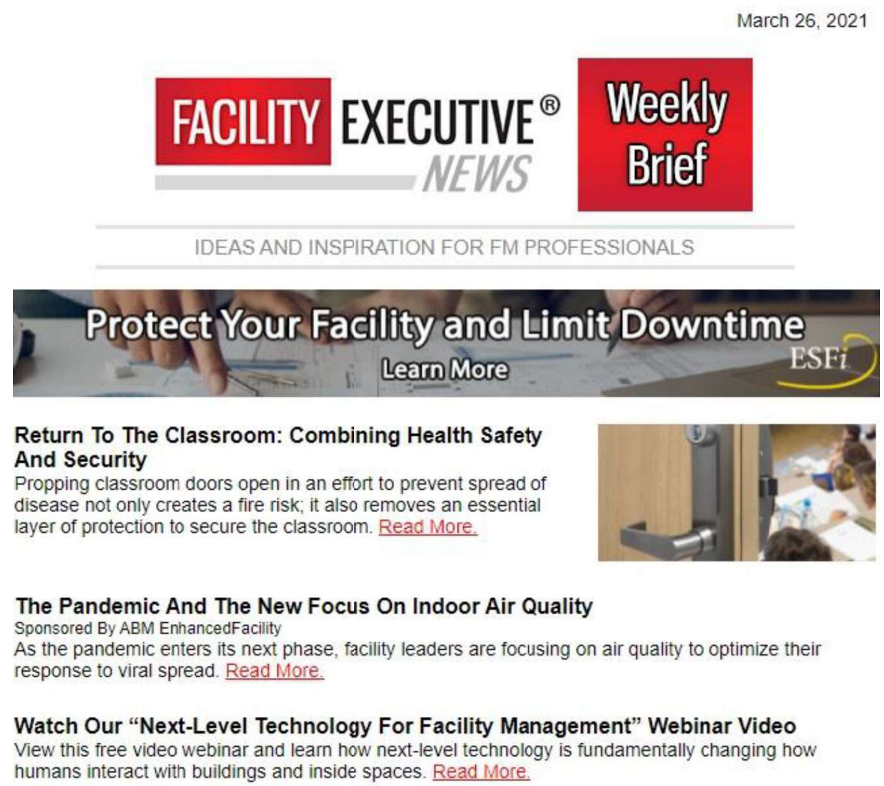
CMP-2 is has proposed to revise the definition for "Dormitories."

5VS – SPD AWARENESS

2021

Press Release, Surge Protective Devices: 3/6/2021 – 4/21/2021

- 3,998 total views
- 115 link clicks
  - Susceptibility of Electrical and Electronic Components to Surge Damage: 23
  - esfi.org: 22
  - NEMASurge.org : 20
  - Power Quality Monitors: From a Transient Perspective: 19
  - Impact of Surges on Equipment: Susceptibility of Electronics to Surge Damage: 17
  - Surge Protective Device Specification Guide for Low Voltage Power Distribution Systems: 14


March 26, 2021

FACILITY EXECUTIVE® NEWS Weekly Brief

IDEAS AND INSPIRATION FOR FM PROFESSIONALS

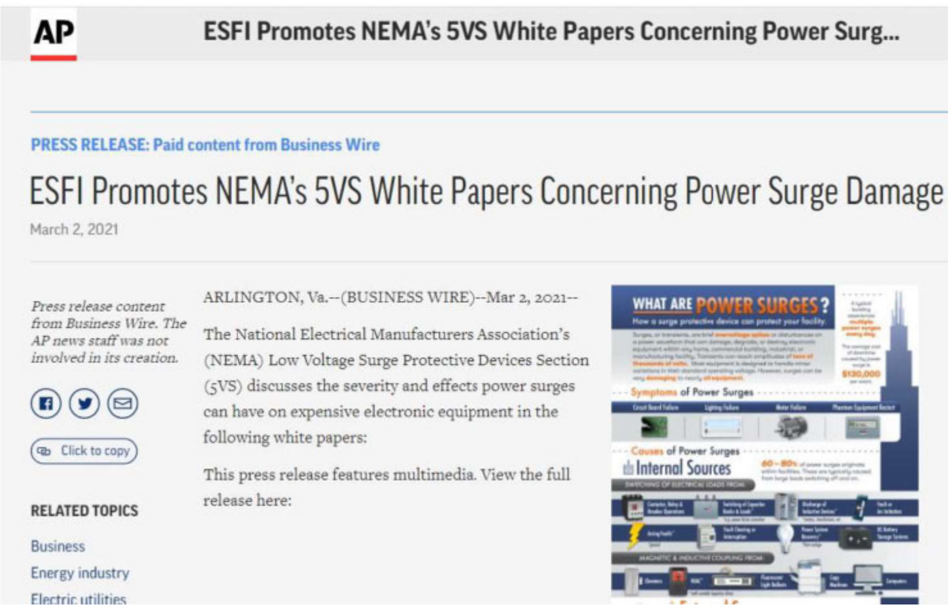
Protect Your Facility and Limit Downtime
Learn More
ESFi

Return To The Classroom: Combining Health Safety And Security
Propping classroom doors open in an effort to prevent spread of disease not only creates a fire risk; it also removes an essential layer of protection to secure the classroom. Read More.

The Pandemic And The New Focus On Indoor Air Quality
Sponsored By ABM EnhancedFacility
As the pandemic enters its next phase, facility leaders are focusing on air quality to optimize their response to viral spread. Read More.

Watch Our "Next-Level Technology For Facility Management" Webinar Video
View this free video webinar and learn how next-level technology is fundamentally changing how humans interact with buildings and inside spaces. Read More.

Press Release, Surge Protective Devices: 3/6/2021 – 4/21/2021


AP

ESFI Promotes NEMA's 5VS White Papers Concerning Power Surg...

PRESS RELEASE: Paid content from Business Wire

ESFI Promotes NEMA's 5VS White Papers Concerning Power Surge Damage

March 2, 2021

Press release content from Business Wire. The AP news staff was not involved in its creation.

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RELATED TOPICS

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Electric utilities

ARLINGTON, Va.--(BUSINESS WIRE)--Mar 2, 2021--

The National Electrical Manufacturers Association's (NEMA) Low Voltage Surge Protective Devices Section (5VS) discusses the severity and effects power surges can have on expensive electronic equipment in the following white papers:

This press release features multimedia. View the full release here:

- 155 multimedia views
  - Critical infrastructure: 106
  - What are power surges: 28
  - ESFI logo: 21

- 57 syndicated article reprints
  - A press release that's republished by a third-party publication or website.
  - 153 confirmed online postings for a total of 44.4M unique visitors
    - Websites that have had confirmed postings of the press release and their combined unique visitors per month

Press Release, Surge Protective Devices: 3/6/2021 – 4/21/2021

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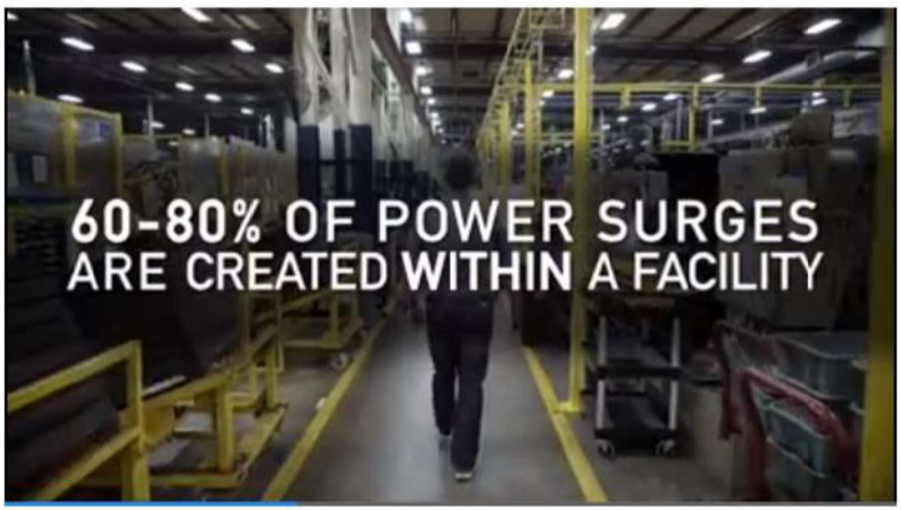

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ESFI Promotes NEMA's 5VS White Papers Concerning Power Surge Damage

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ESFI Promotes NEMA's 5VS White Papers Concerning Power Surge Damage

By: ESFI via Business Wire News Releases March 02, 2021 at 14:15 PM EST

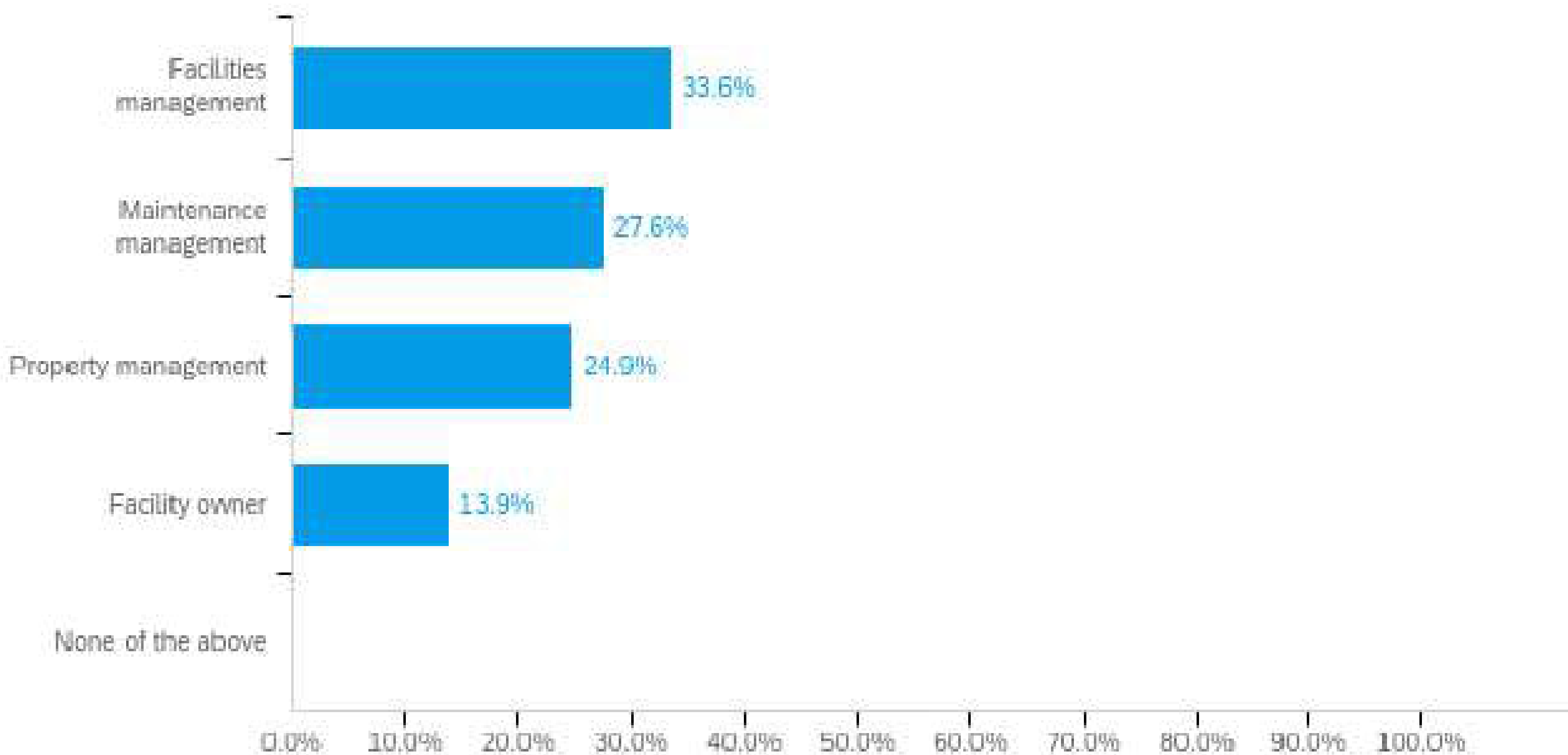
ESFi

The National Electrical Manufacturers Association's (NEMA) Low Voltage Surge Protective Devices Section (5VS) discusses the severity and effects power surges can have on expensive electronic equipment in the following white papers:

This press release features multimedia. View the full release here: https://www.businesswire.com/news/home/20210302006038/en/

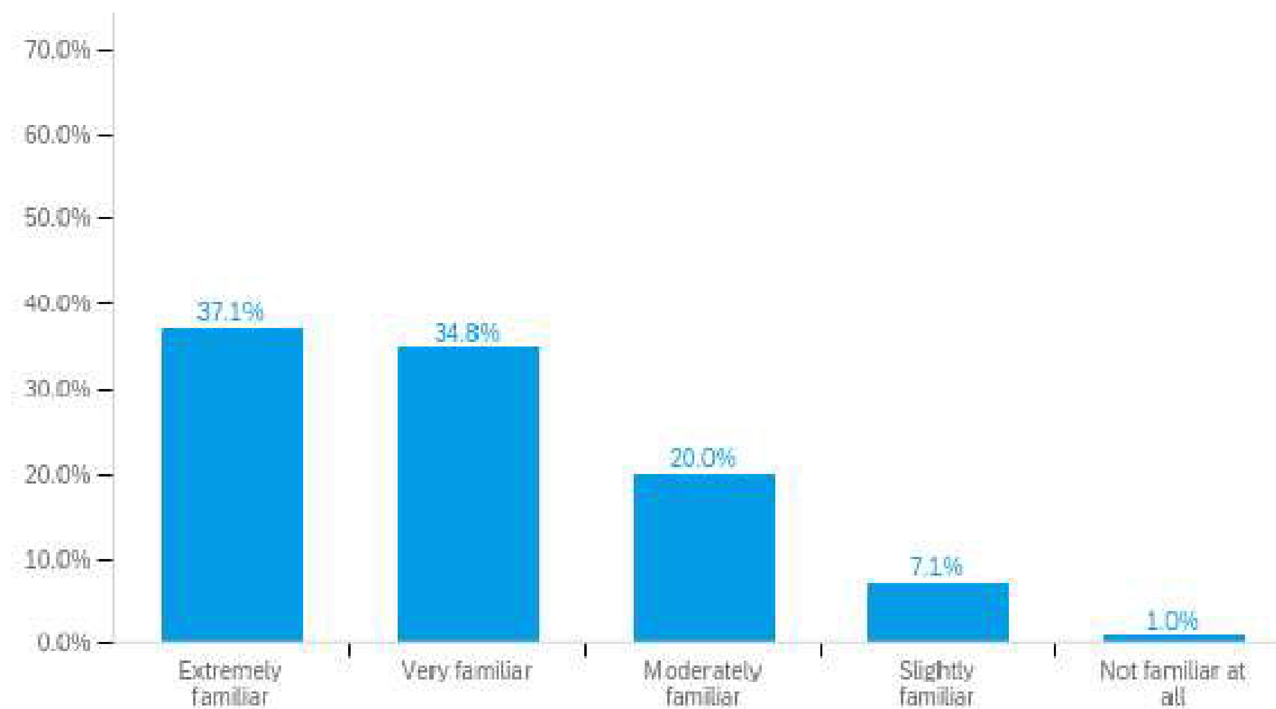
2021 Survey

- **In carrying out the responsibilities of your occupation, does your role involve any of the following? (select all that apply)**



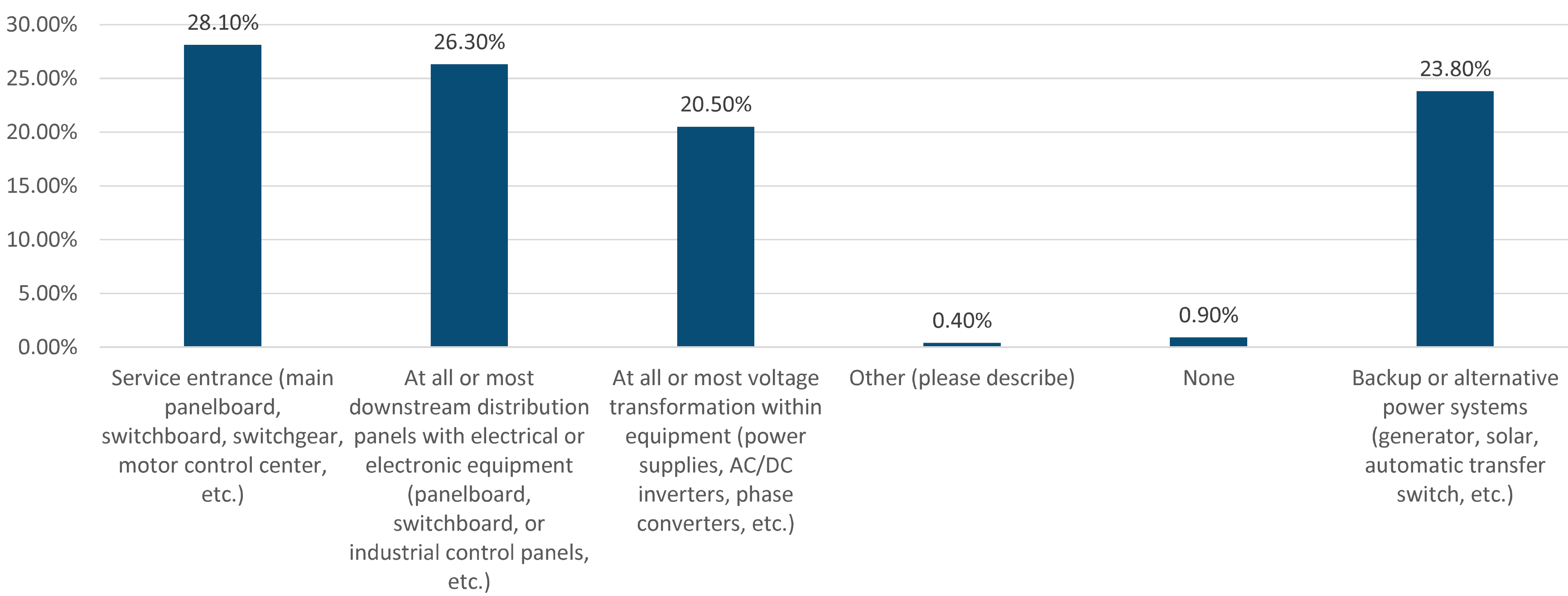
2021 Survey

- **How familiar are you with voltage surges, also known as power surges, spikes, or transients?**



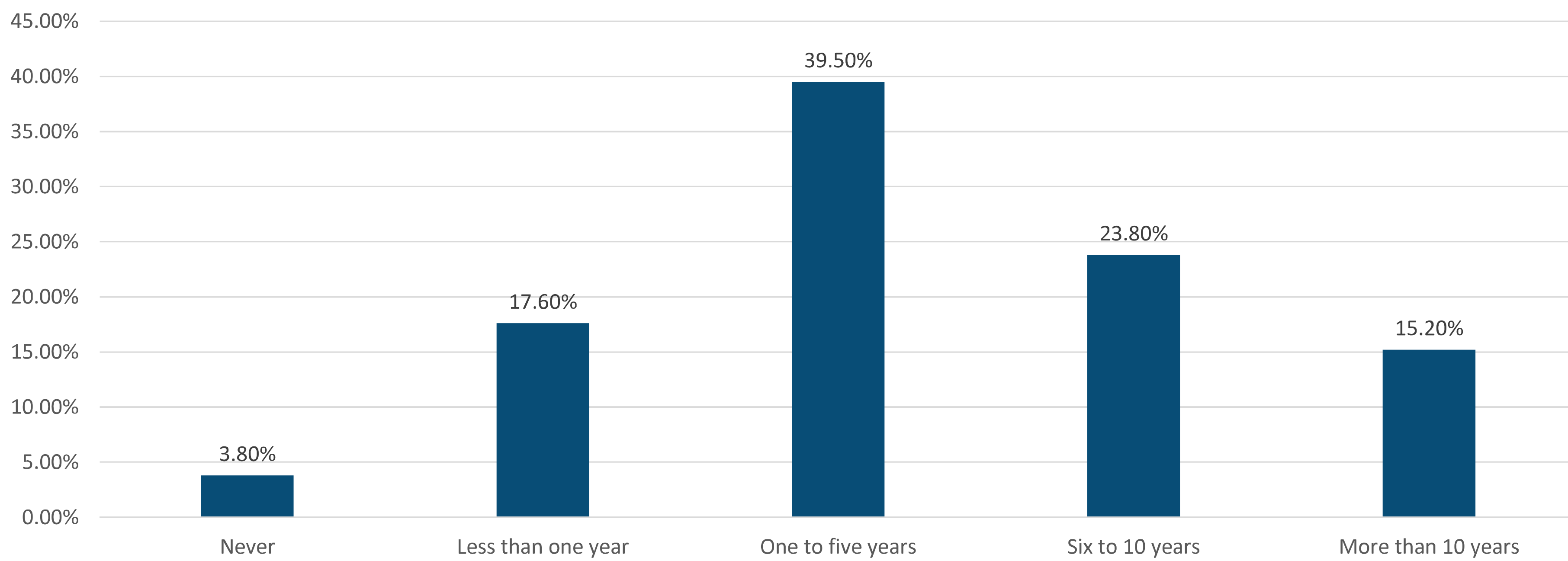
2021 Survey

- **In what locations of your facility are surge protective devices installed?**



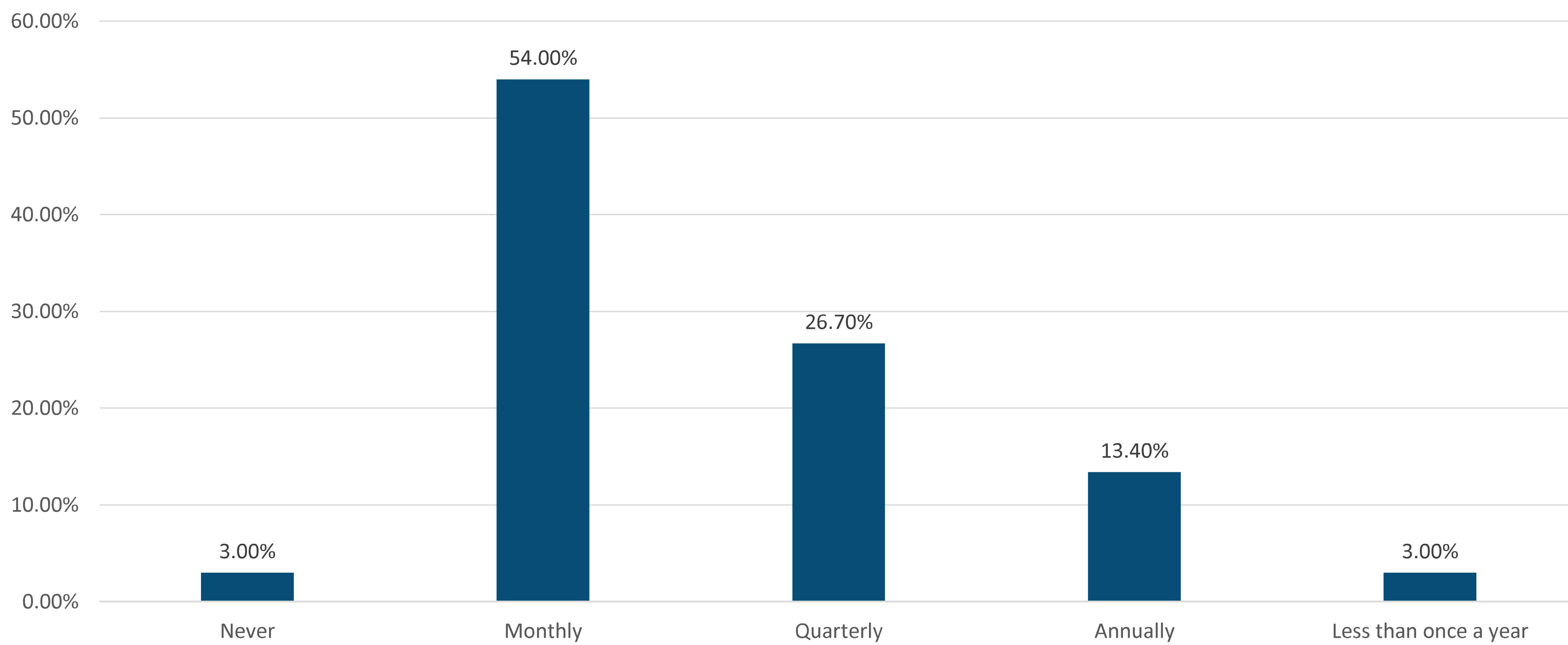
2021 Survey

- **How long has your facility had surge protection technology? [Note: if you manage more than one facility, please answer in terms of the most recent addition of surge protection technology]**



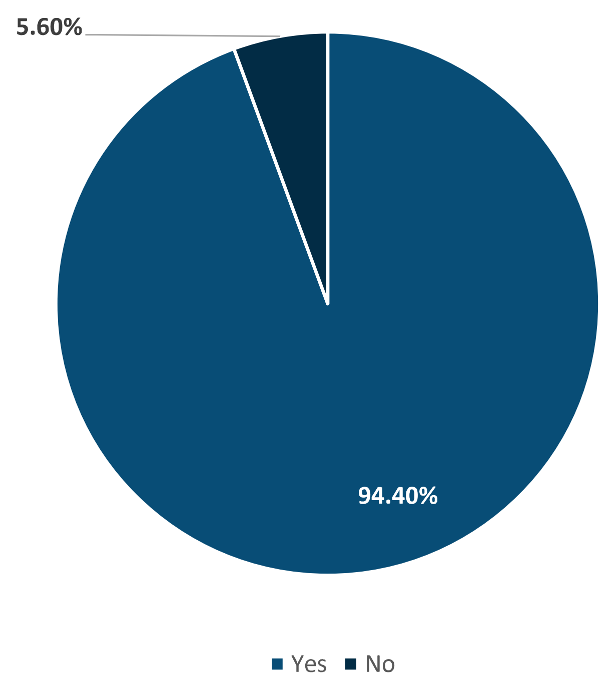
2021 Survey

- **How frequently do you have your surge protective devices inspected/tested?**



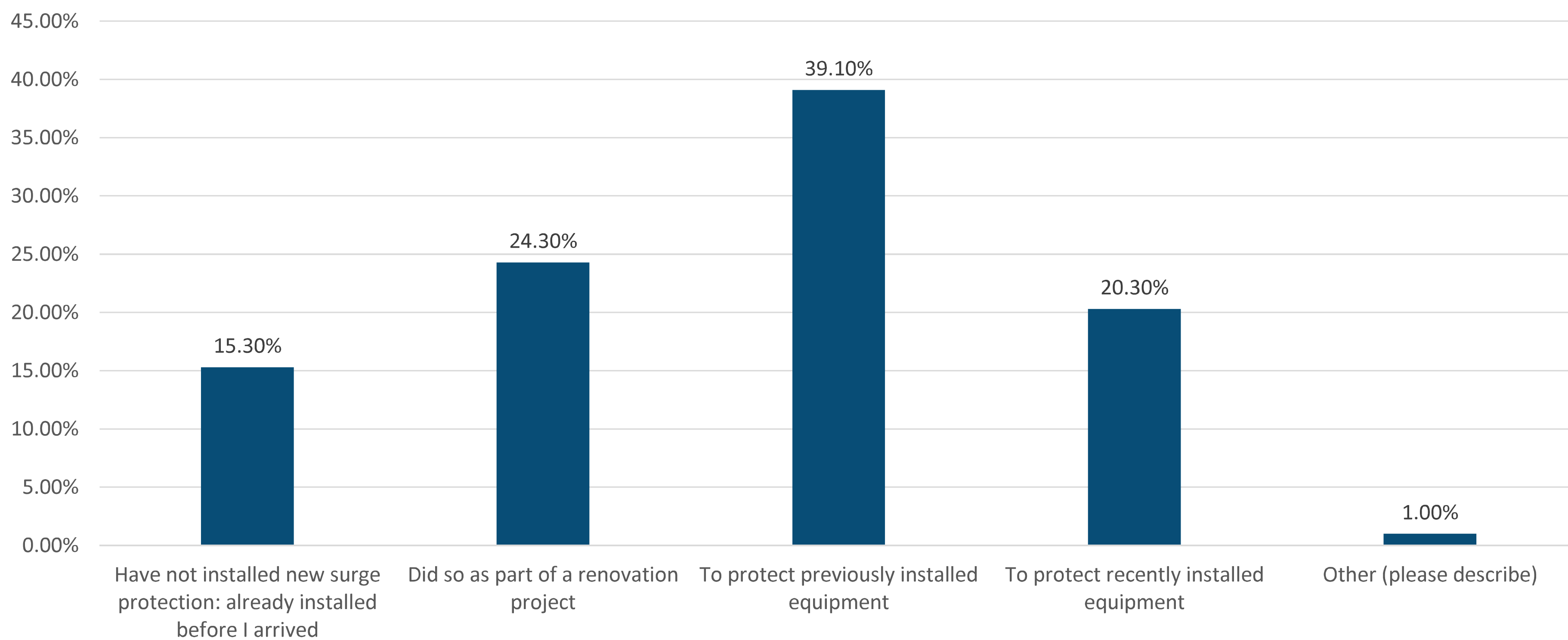
2021 Survey

- **Is inspection/testing of your facility's surge protective devices part of your overall routine maintenance/inspection plan?**



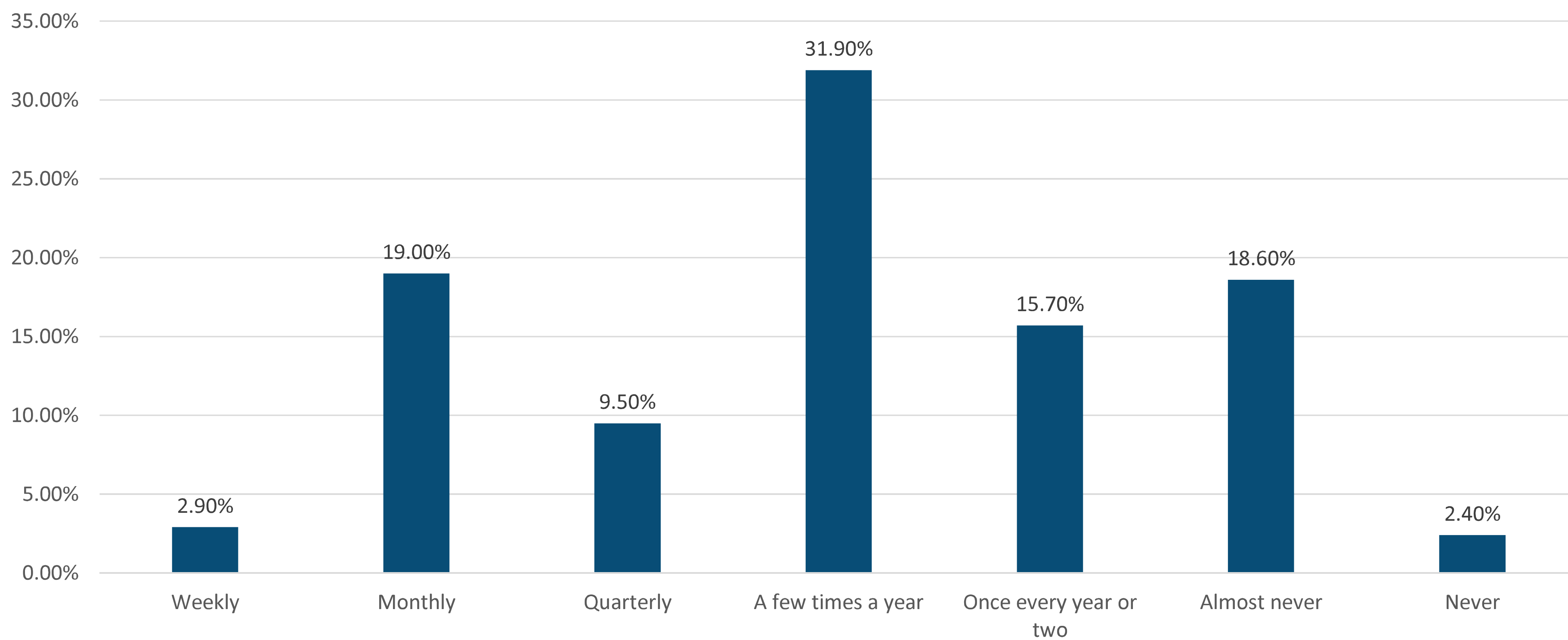
2021 Survey

- **What is the main reason why you chose to install surge protection in your facility?**



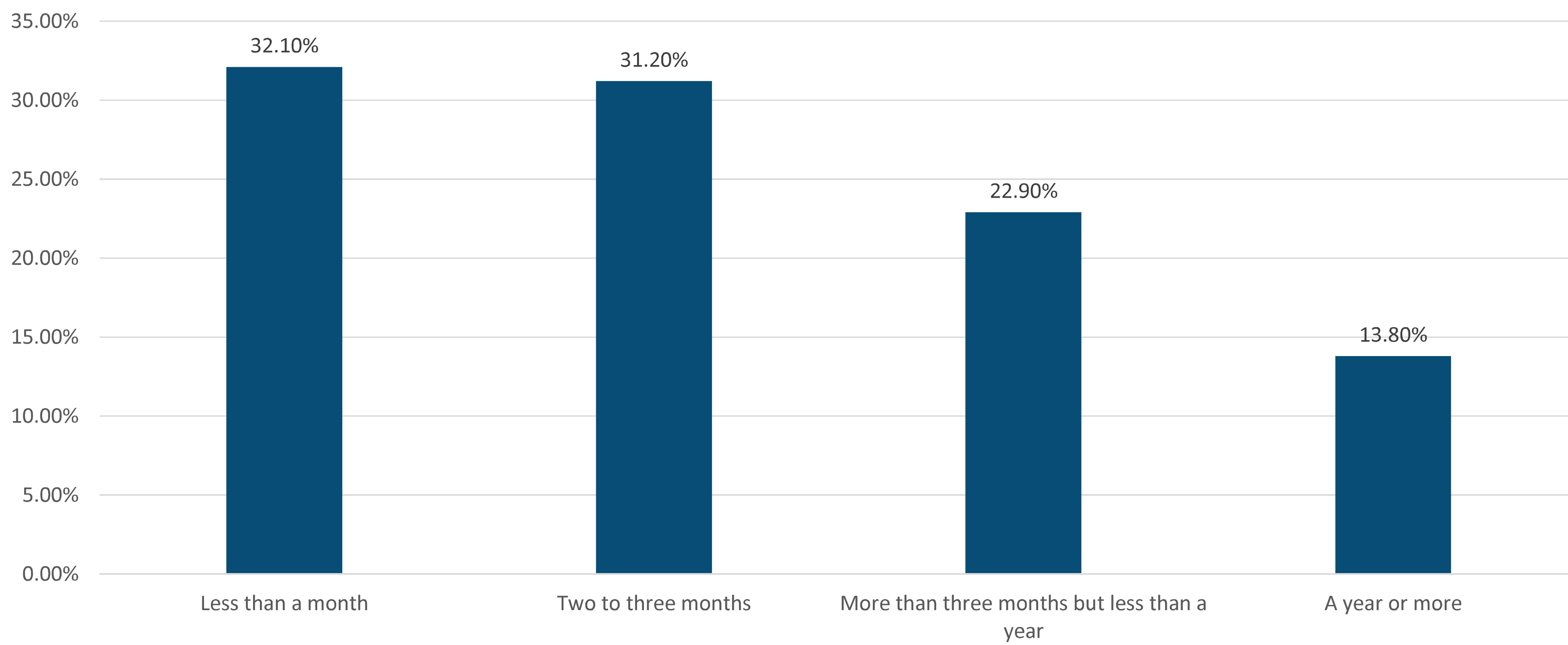
2021 Survey

- **How often does your facility experience unplanned downtime from any cause?**



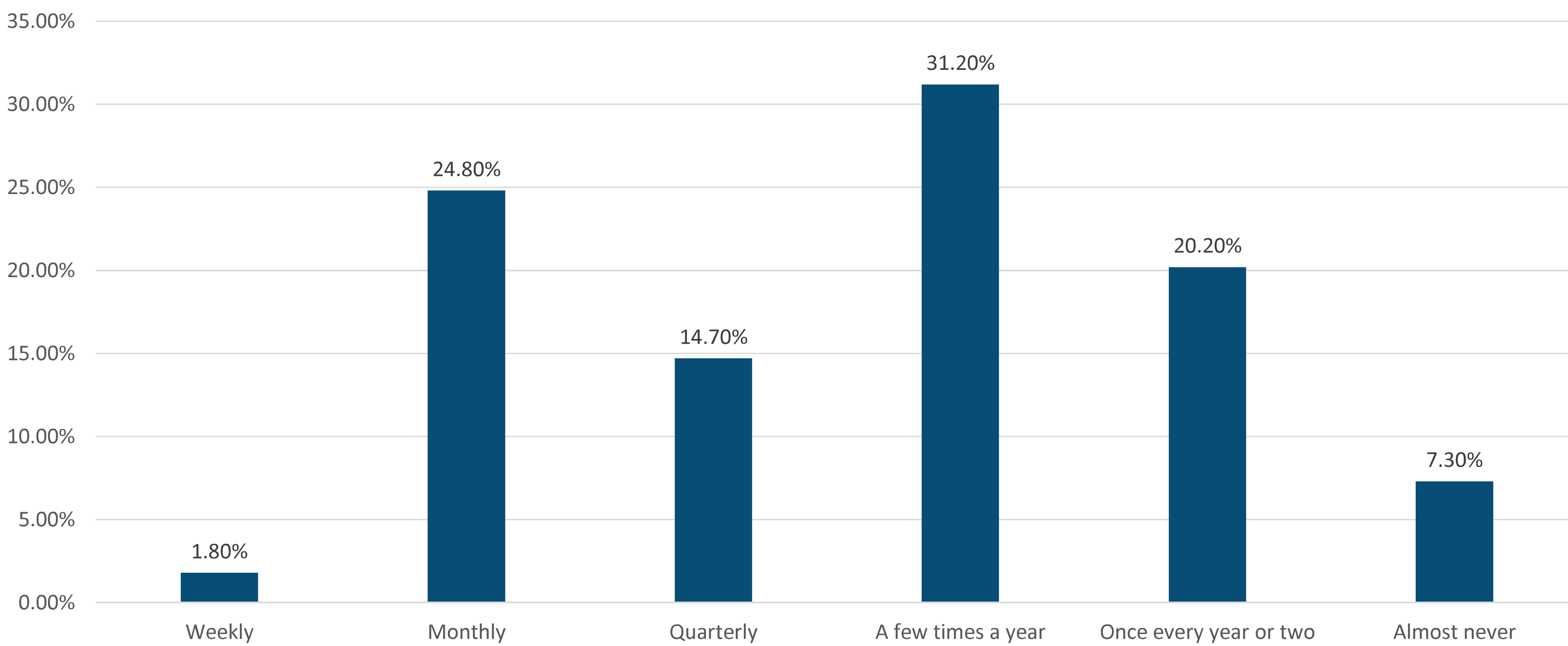
2021 Survey

- **How recently did your facility experience a voltage surge?**



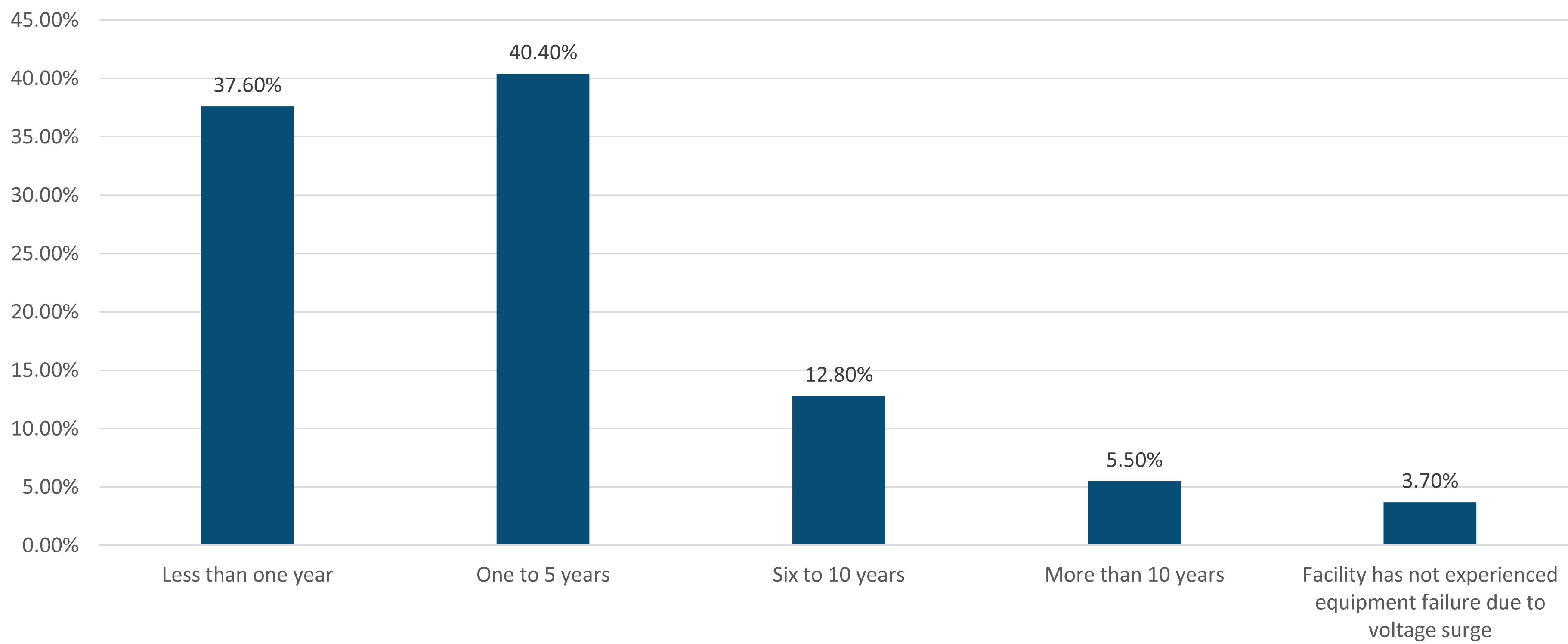
2021 Survey

- **How often does your facility experience voltage surges?**



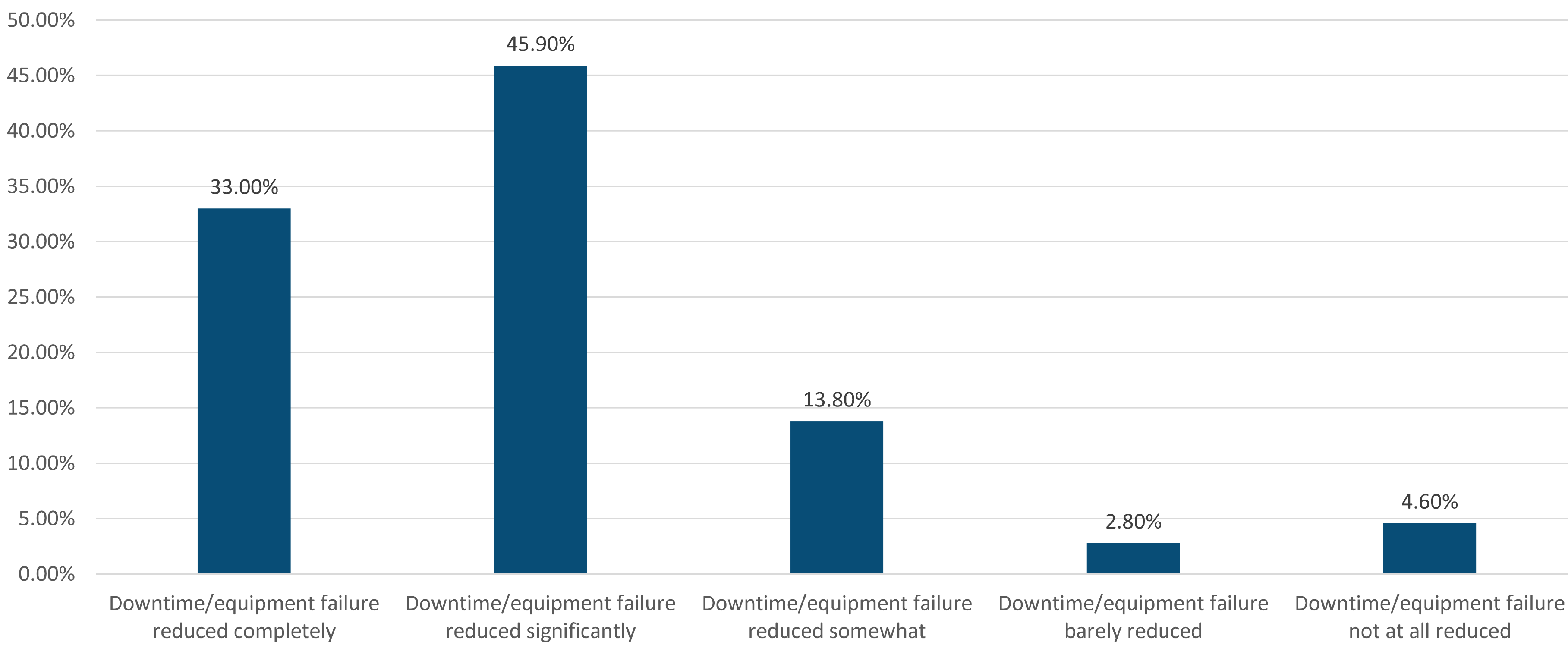
2021 Survey

- **In the most recent case of equipment failure due to voltage surge at your facility, how long had the device that failed been in service?**



2021 Survey

- **How much would you say the installation of surge protective devices has cut down on the amount of downtime/equipment failure at your facility?**



2021 Work

- **Q2**
  - Survey
    - Survey and Data collection completed on 4/12/2021
    - Data is currently being reviewed and summary will be provided shortly
    - Infographic will be created based on survey findings
  - Survey promotion
    - Survey and its findings will be used to promote and educate facilities on the importance of proper surge protection in facilities and buildings during June, National Safety Month
- **Q3 – Q4:**
  - Promotion of survey and past ESFI surge materials

- 2022
  - Future work:
    - Additional surveys?
    - Specific infographic / promotion?
    - Video produced in facilities?

UNDERSTANDING
SURGE PROTECTIVE DEVICES SURVEY

In 2021, the **Electrical Safety Foundation International** surveyed industrial and commercial facility professionals, including managers, owners, building engineers, heads of maintenance, and related occupations. These professionals **provided insights** regarding power surge incidences and effects, as well as usage of **Surge Protective Devices** in the facilities they manage.

COMMON VOLTAGE SURGE CAUSES

- **Switching** of Electrical Loads
- Lightning
- **Faulty Wiring** and/or Connections
- **Damage** to Power Lines

INSTALL SURGE PROTECTIVE DEVICES TO PREVENT DOWNTIME & PROTECT EQUIPMENT

SURGE PROTECTIVE DEVICES *WORK*

79% of facilities state that **Surge Protective Devices** have cut down on the amount of **downtime** and **equipment failure.**

UNPLANNED OUTAGES *CAUSES*

34% of unplanned outages are caused by **power surges** and **unexpected resetting** or **mis-operation** of equipment (Commonly caused by power surges).

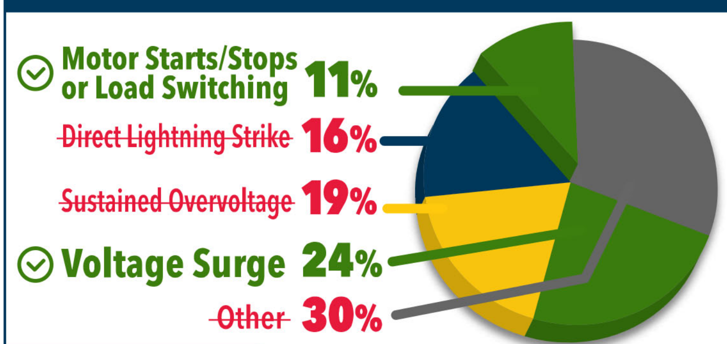
Unexpected downtime is common with over **72%** of facilities surveyed experiencing downtime more than a few times a year.

- **23%** of facilities installed Surge Protective Devices after **experiencing a surge event**
- **78%** of equipment failure caused by power surges were in service for **five years or less**
- **49%** reported that a power surge had caused an interruption **within the last 12 months**

SURGE PROTECTIVE DEVICE & POWER SURGE MISCONCEPTIONS

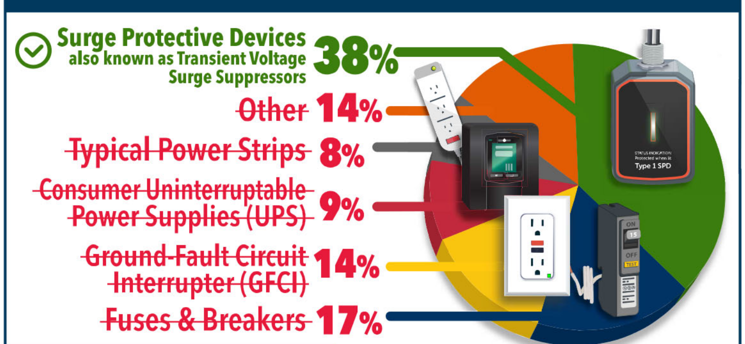
Respondent's knowledge of surge protective capabilities **revealed mixed results.**

WHAT CAN A TYPICAL SURGE PROTECTIVE DEVICE *PROTECT AGAINST?*



Surge Protective Devices only protect against ***voltage surge events***, no matter the source

WHICH OF THE FOLLOWING *DO YOU BELIEVE PROVIDE SURGE PROTECTION?*



Only ***Surge Protective Devices*** aka ***Transient Voltage Surge Suppressors*** protect against Power Surges

VISIT **ESFI.ORG** AND **NEMASURGE.ORG** TO SEE FULL SURVEY RESULTS & LEARN MORE ABOUT SURGE PROTECTIVE DEVICES

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Facility Managers' Understanding of Power Surges and Surge Protective Devices

We received completed survey questionnaires from 210 domestic respondents identified from a database of industrial and commercial facility professionals, including managers, owners, building engineers, heads of maintenance, and related occupations. These professionals provided insights regarding power surge incidences and effects, as well as usage of surge protective devices in the facilities they manage.

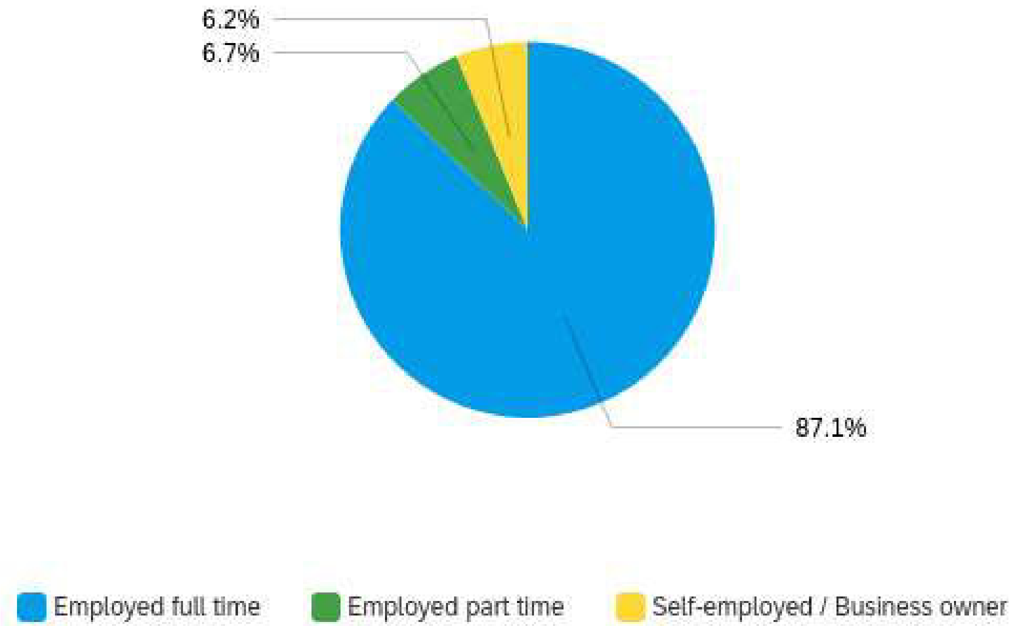
Key Findings

- The vast majority of respondents (72%) claimed to be either “very” or “extremely familiar” with voltage surges, while only 8 percent were only “slightly” or “not familiar at all”
- The most commonly-cited causes of voltage surges were “switching of electrical loads,” “lightning,” “faulty wiring and/or connections,” and “damage to power lines”
- From among the choices provided, facility managers’ answers about surge protective device installation locations were relatively evenly distributed between “service entrance” (28%), “at all or most downstream distribution panels with electrical or electronic equipment” (26%), “backup or alternative power systems” (24%), and “at all or most voltage transformation within equipment” (20%)
- Use of the question, “What can a typical surge protective device protect against,” to test respondents’ knowledge of SPD capabilities revealed mixed results with one correct response receiving the greatest share of selections while another correct answer received the lowest share. Meanwhile, two incorrect responses were similarly far-flung with one receiving the second-highest number of selections and the other garnering the second-fewest
    - Although both choices were correct, “voltage surge” (24%) and “motor starts/stops or load switching” (11%) ended at opposite poles
    - Likewise, the frequency with which respondents selected circumstances not managed by SPDs, “sustained overvoltage” (19%) and “overload caused by operating equipment above full-load rating” (14%), placed those responses near the top and bottom of the list as well
- In response to being asked which technologies provide surge protection, the most frequent selections were “surge protective devices” (24%), “fuses and breakers” (17%), and “transient voltage surge suppressors” (15%), with “typical power strips” (8%) seeing the fewest selections
- A plurality of survey panelists indicated that their facilities had had surge protection technology for one to five years (40%), and an additional 39 percent had surge protection for six or more years
- Twenty-three percent of respondents indicated that they purchased surge protection devices after experiencing a surge event, and other catalysts, such as “at build/specification” (27%) and “at renovation,” (23%) were reported at a similar frequency
- A majority of facility managers reported having surge protection devices inspected or tested monthly (54%)
    - Nearly all those who tested or inspected their SPDs (94%) did so as part of routine maintenance

- Perhaps surprisingly, more managers chose to install surge protection to “protect previously installed equipment” (39%) and “as part of a renovation project” (24%) than to “protect recently installed equipment” (20%)
- When asked about success stories regarding installed surge suppression, many mentioned maintaining uptime in the midst of lightning strikes or grid anomalies, while several others noted that the absence of visible evidence of surge activity in general suggested successful operation of surge protection devices
- Among the handful of respondents that do not currently have surge protection installed, most (62%) said that it has been recommended for their facilities
    - Twenty-one percent of those without surge protection say that they plan on installing it in the future
- Unexpected downtime was a relatively frequent event, with 72 percent reporting experiencing downtimes more than a few times a year
    - Downtimes are typically brief, lasting one hour or less, according to 65 percent of respondents
    - Power surges (14%) were the third-most commonly cited cause of unplanned outages following human error (21%) and accidents (18%)
    - Although a handful of respondents’ reported costs skewed the mean measurement, the median annual cost of downtime was $5,000
- Asked of those whose facilities had ever experienced unexpected downtime (n=205), 49 percent reported that a power surge had caused such an interruption within the last 12 months
    - The most recent power surge-caused downtime reported by respondents resulted in being offline for between 30 and 60 minutes for 42 percent of facility managers, and the vast majority (90%) of incidents lasted for one and a half hours or less
    - Of those whose facilities experienced unplanned downtime, 49 percent indicated that a power surge had taken operations offline within the last 12 months, with most of those outages (68%) lasting one hour or less
    - Voltage surges resulted in equipment restart or mis-operation for 57 percent of responding managers, with slightly fewer facilities operators reporting power outage or equipment failure (53%) because of such incidents
    - For 63 percent of respondents, the most recent voltage surge at their facilities occurred quite recently, no more than three months prior to responding to the survey
    - However, most facilities experienced voltage surges relatively infrequently, as 59 percent reported surges happening “a few times a year,” “once every year or two,” or “almost never”
    - Power fluctuations on the grid (27%) were the most commonly mentioned cause of facility voltage surges, followed closely by “faulty wiring and/or connections” (25%), and “lightning” (22%)
    - On average, facility managers indicated that 60 percent of voltage surges affecting their facilities resulted from outside factors
    - Equipment recently placed in service seem to have borne the brunt of voltage surges that resulted in failure, with 78 percent of failed equipment having been in service for five years or less
    - Surge protective devices were clearly viewed as a success by most respondents, as 79 percent estimated that downtime/equipment failure was reduced significantly or completely
    - Of those who reported equipment failure for any reason after warranty expiration (n=163), most failures (85%) happened recently, within 5 or fewer years of warranty expiration date

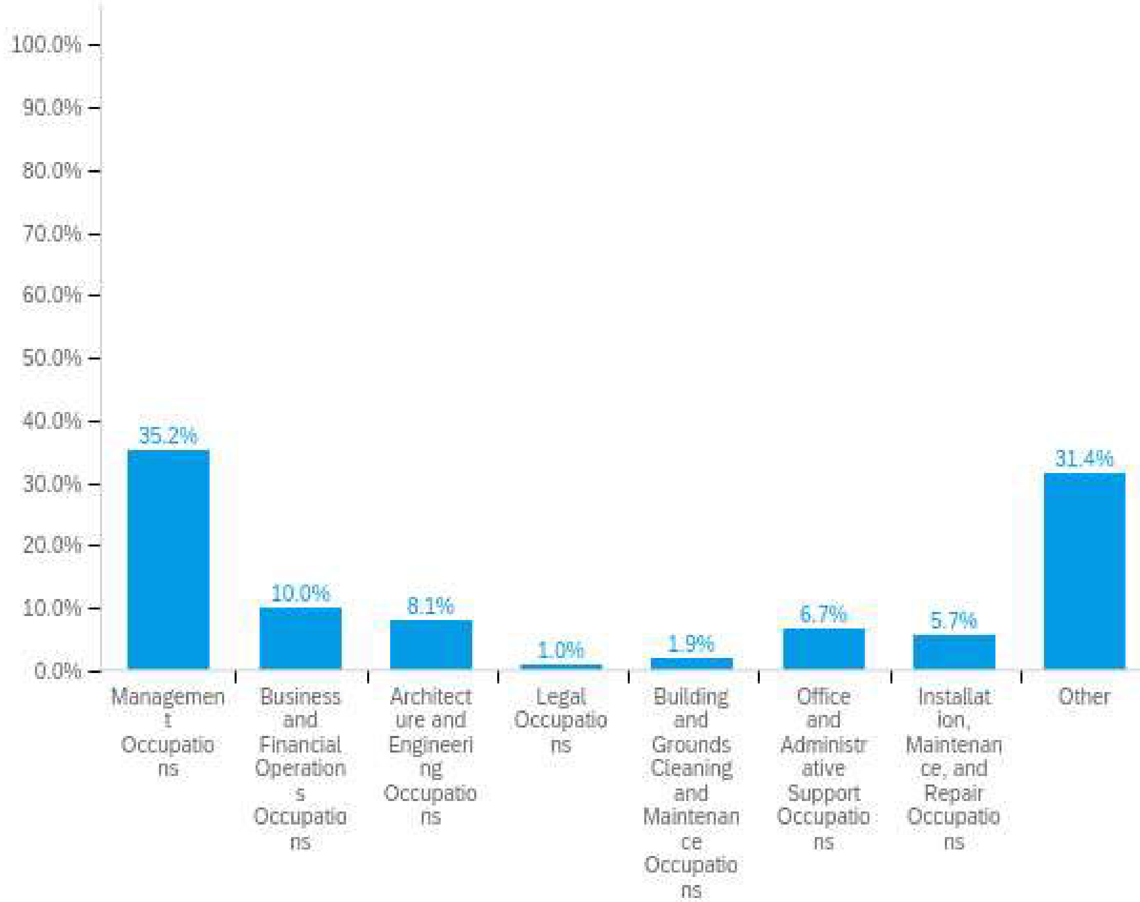
- Although a somewhat concerning 16 percent of respondents had never performed a resistance reading on their facility's grounding systems or were not sure when one was last conducted, nearly 71 percent had done so within the last 12 months

How would you describe your current employment status?



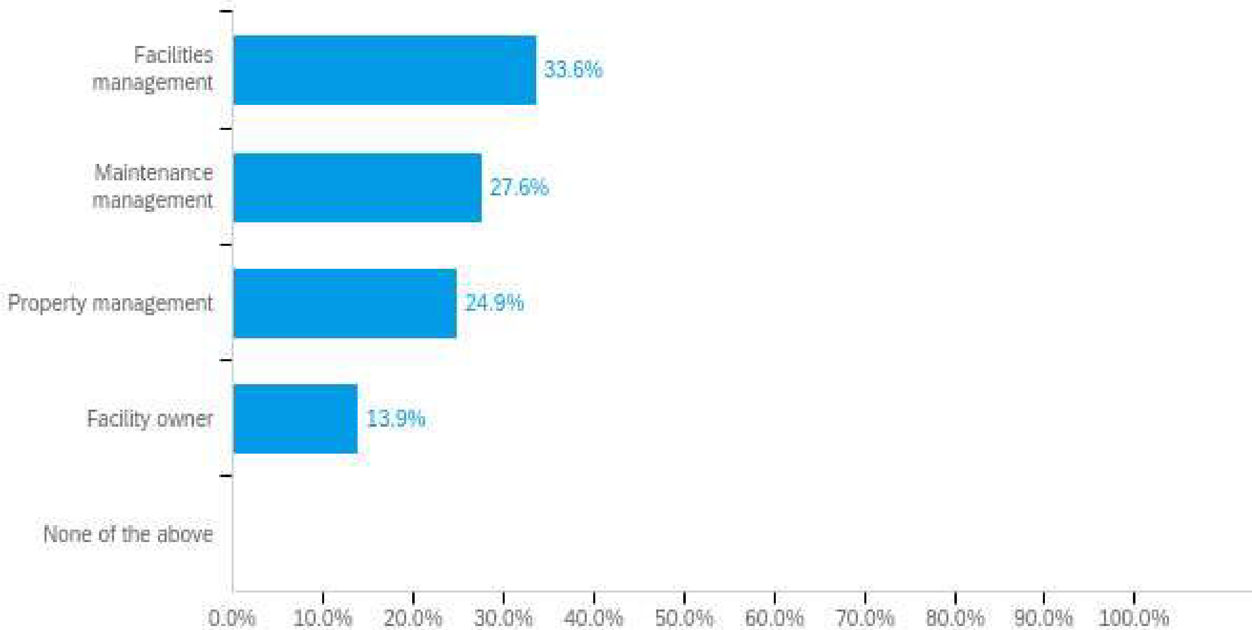
Answer	%	Count
Employed full time	87.1%	183
Employed part time	6.7%	14
Self-employed / Business owner	6.2%	13
Unemployed / Looking for work	0.0%	0
Student	0.0%	0
Homemaker	0.0%	0
Retired	0.0%	0
Other	0.0%	0
Total	100%	210

Please indicate your occupation:



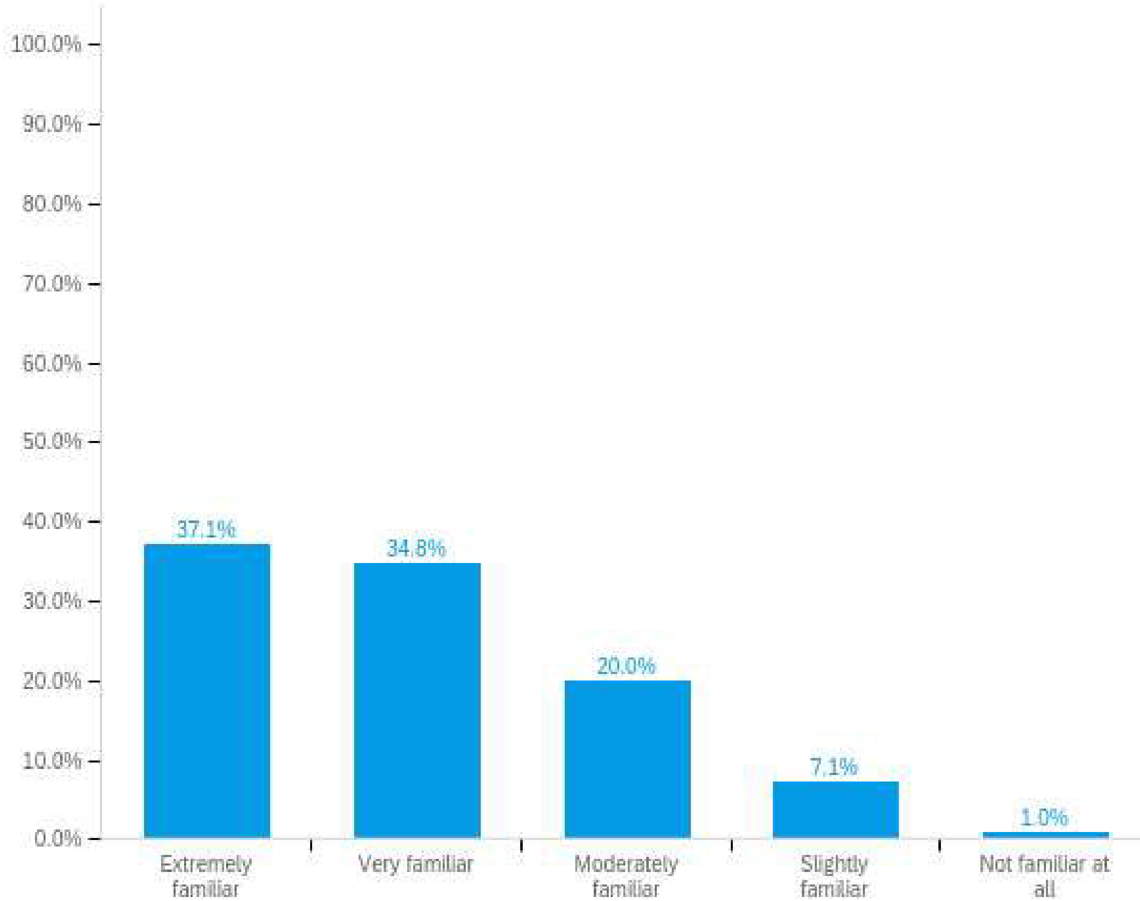
Answer	%	Count
Management Occupations	35.2%	74
Business and Financial Operations Occupations	10.0%	21
Computer and Mathematical Occupations	0.0%	0
Architecture and Engineering Occupations	8.1%	17
Life, Physical, and Social Science Occupations	0.0%	0
Community and Social Service Occupations	0.0%	0
Legal Occupations	1.0%	2
Education, Training, and Library Occupations	0.0%	0
Arts, Design, Entertainment, Sports, and Media Occupations	0.0%	0
Healthcare Practitioners and Technical Occupations	0.0%	0
Healthcare Support Occupations	0.0%	0
Protective Service Occupations	0.0%	0
Food Preparation and Serving Related Occupations	0.0%	0
Building and Grounds Cleaning and Maintenance Occupations	1.9%	4
Personal Care and Service Occupations	0.0%	0
Sales and Related Occupations	0.0%	0
Office and Administrative Support Occupations	6.7%	14
Farming, Fishing, and Forestry Occupations	0.0%	0
Construction and Extraction Occupations	0.0%	0
Installation, Maintenance, and Repair Occupations	5.7%	12
Production Occupations	0.0%	0
Transportation and Material Moving Occupations	0.0%	0
Military Specific Occupations	0.0%	0
Other	31.4%	66
Total	100%	210

In carrying out the responsibilities of your occupation, does your role involve any of the following? (select all that apply)



Answer	%	Count
Facilities management	33.6%	123
Maintenance management	27.6%	101
Property management	24.9%	91
Facility owner	13.9%	51
None of the above	0.0%	0
Total	100%	366

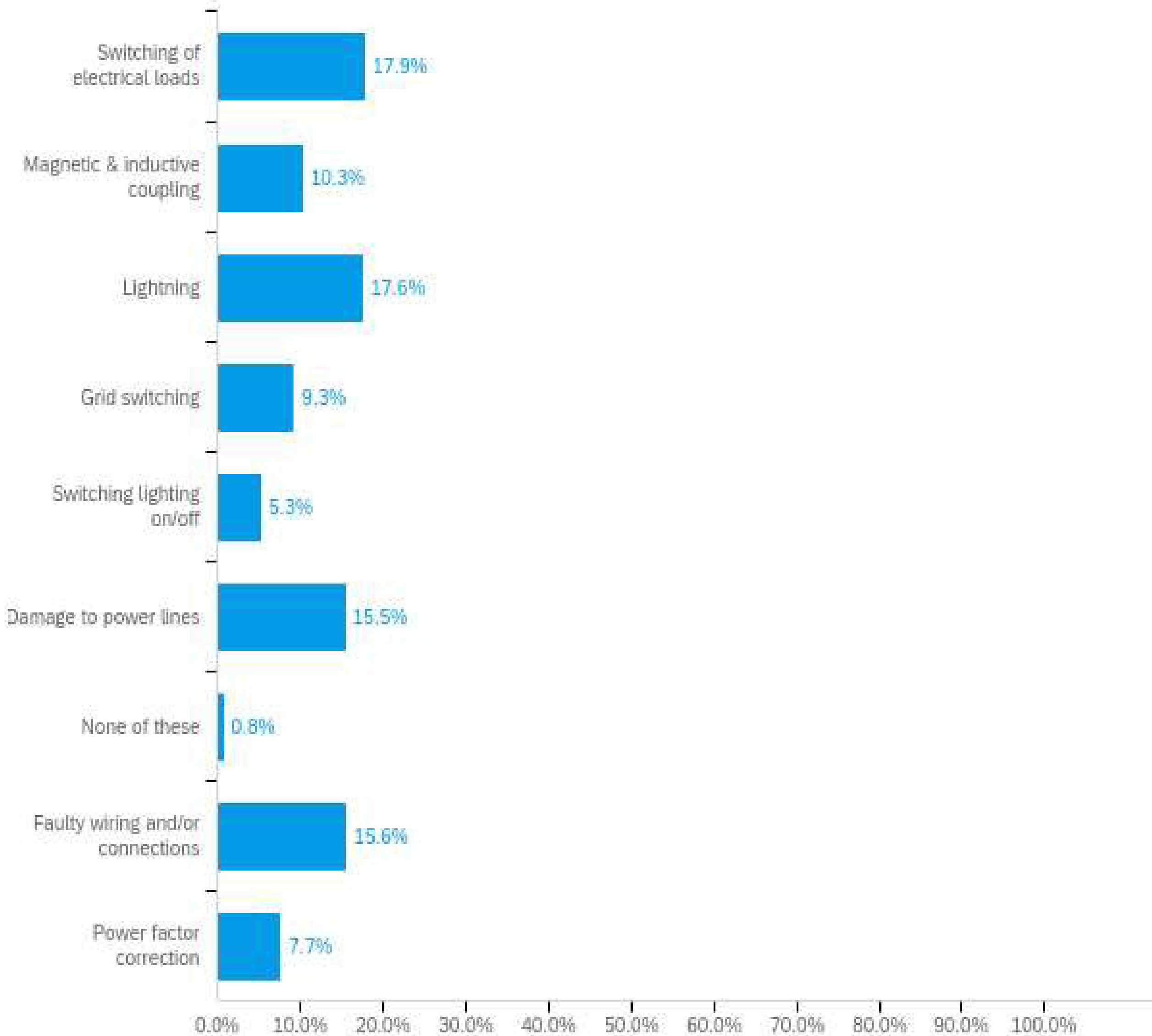
How familiar are you with voltage surges, also known as power surges, spikes, or transients?



Field	Count	Bottom 2 Box	Top 2 Box
How familiar are you with voltage surges, also known as power surges, spikes, or transients?	210	71.9%	8.1%

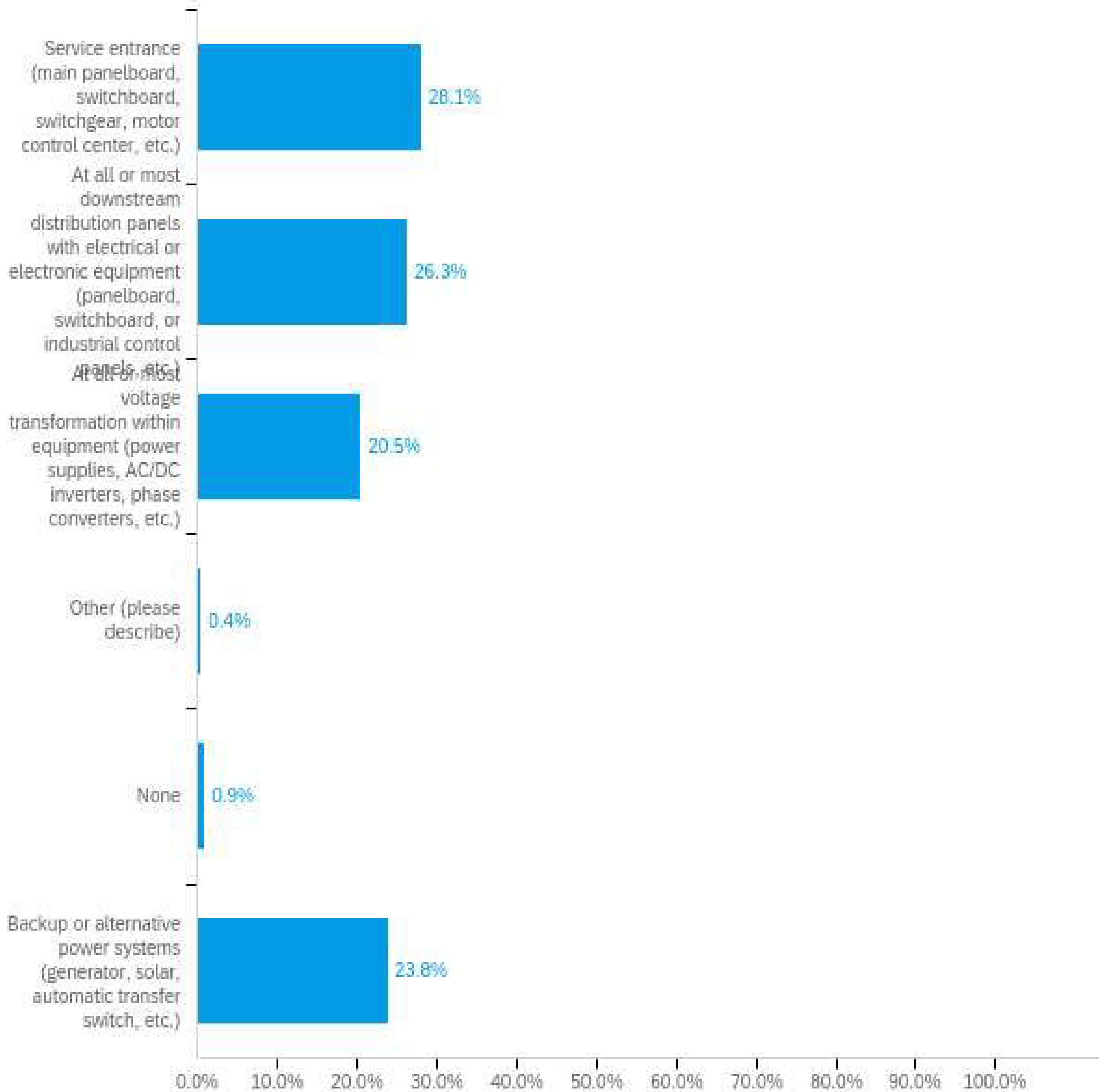
Answer	%	Count
Extremely familiar	37.1%	78
Very familiar	34.8%	73
Moderately familiar	20.0%	42
Slightly familiar	7.1%	15
Not familiar at all	1.0%	2
Total	100%	210

Which of the following may cause voltage surges? [select all that apply]



Answer	%	Count
Switching of electrical loads	17.9%	142
Magnetic & inductive coupling	10.3%	82
Lightning	17.6%	140
Grid switching	9.3%	74
Switching lighting on/off	5.3%	42
Damage to power lines	15.5%	123
None of these	0.8%	6
Faulty wiring and/or connections	15.6%	124
Power factor correction	7.7%	61
Total	100%	794

In what locations of your facility are surge protective devices installed? [select all that apply]

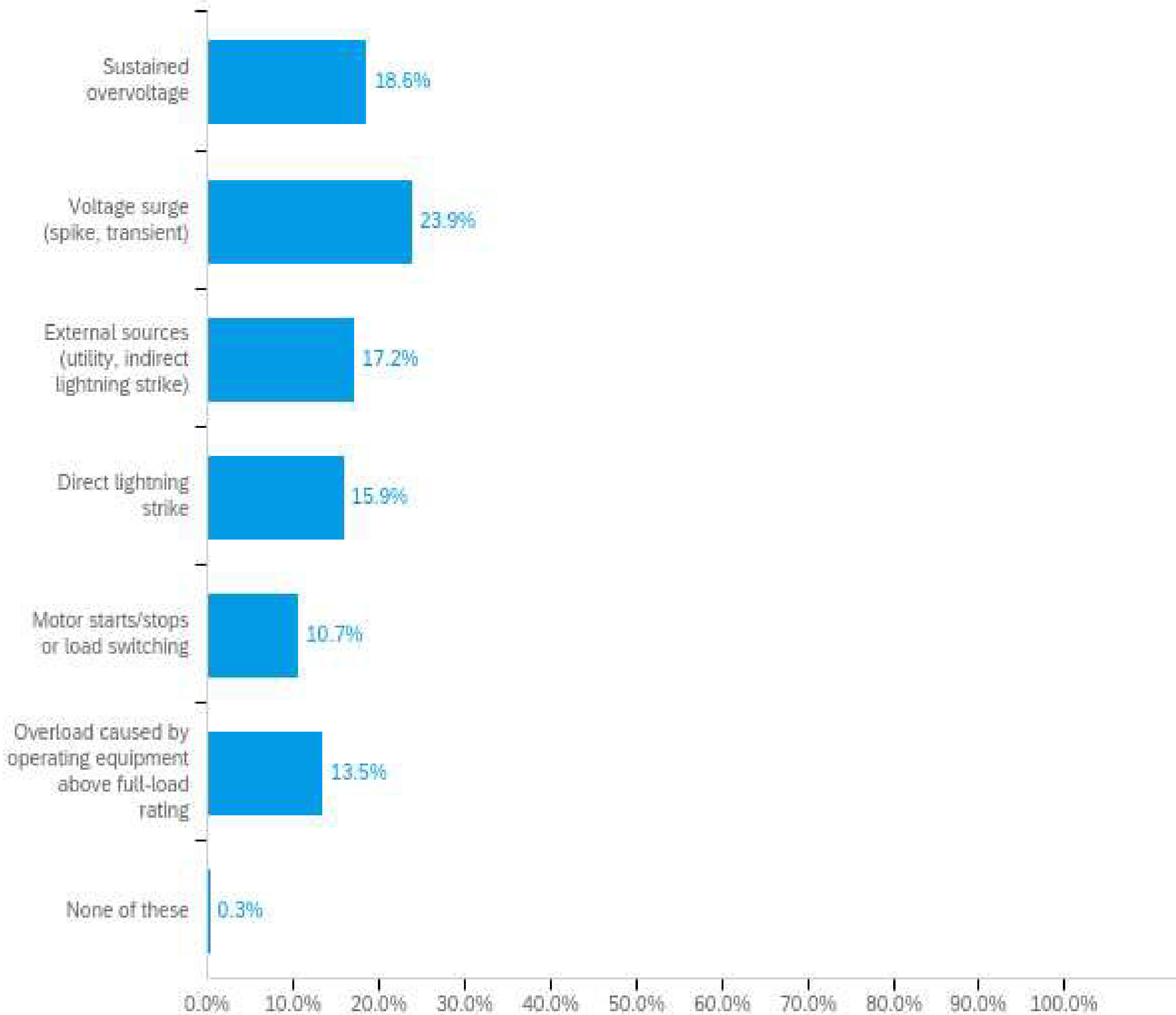


Answer	%	Count
Service entrance (main panelboard, switchboard, switchgear, motor control center, etc.)	28.1%	126
At all or most downstream distribution panels with electrical or electronic equipment (panelboard, switchboard, or industrial control panels, etc.)	26.3%	118
At all or most voltage transformation within equipment (power supplies, AC/DC inverters, phase converters, etc.)	20.5%	92
Other (please describe)	0.4%	2
None	0.9%	4
Backup or alternative power systems (generator, solar, automatic transfer switch, etc.)	23.8%	107
Total	100%	449

“Other” response:

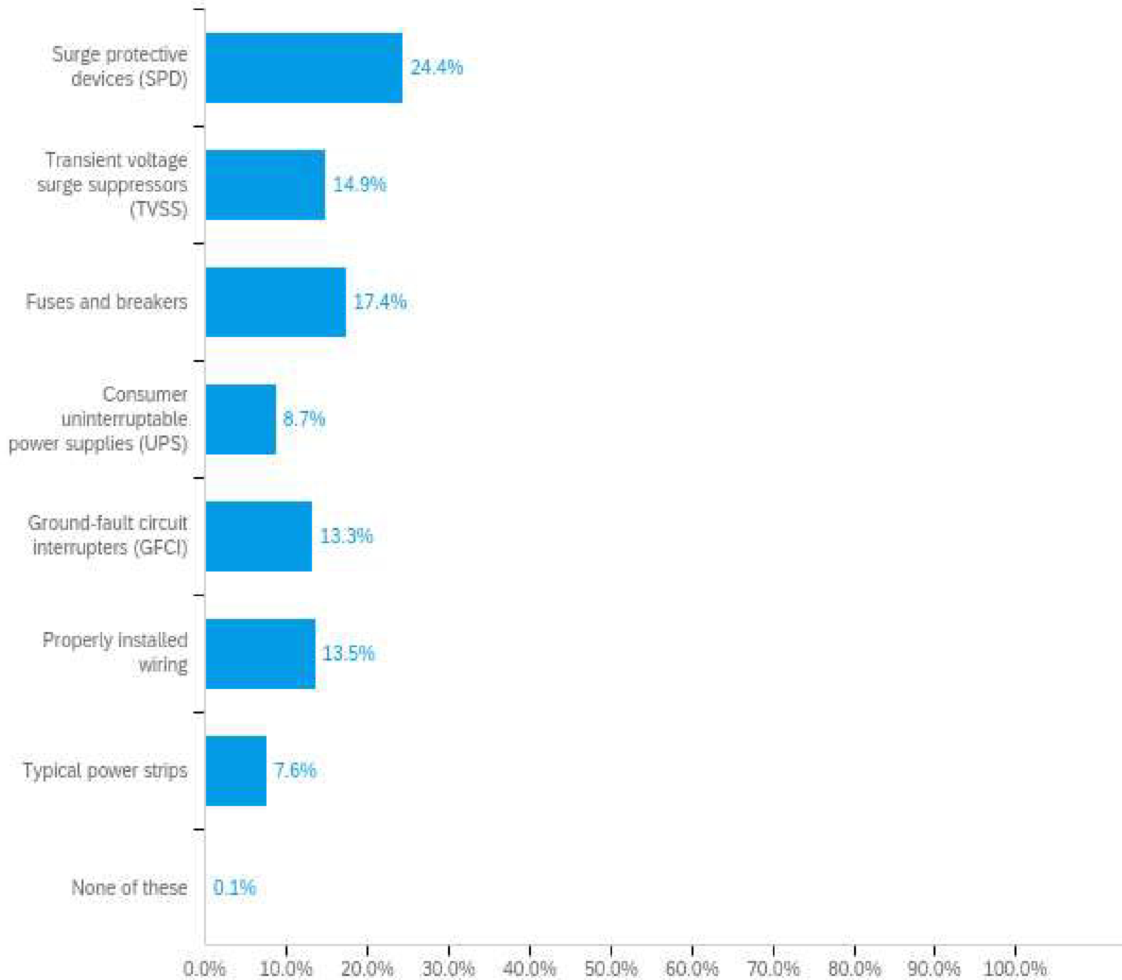
- As far as I know, We have them basically everywhere. My business is very computer orientated. 90% of most people employed here, Work from a PC or laptop.
- surge protector outlets

What can a typical surge protective device protect against? [select all that apply]



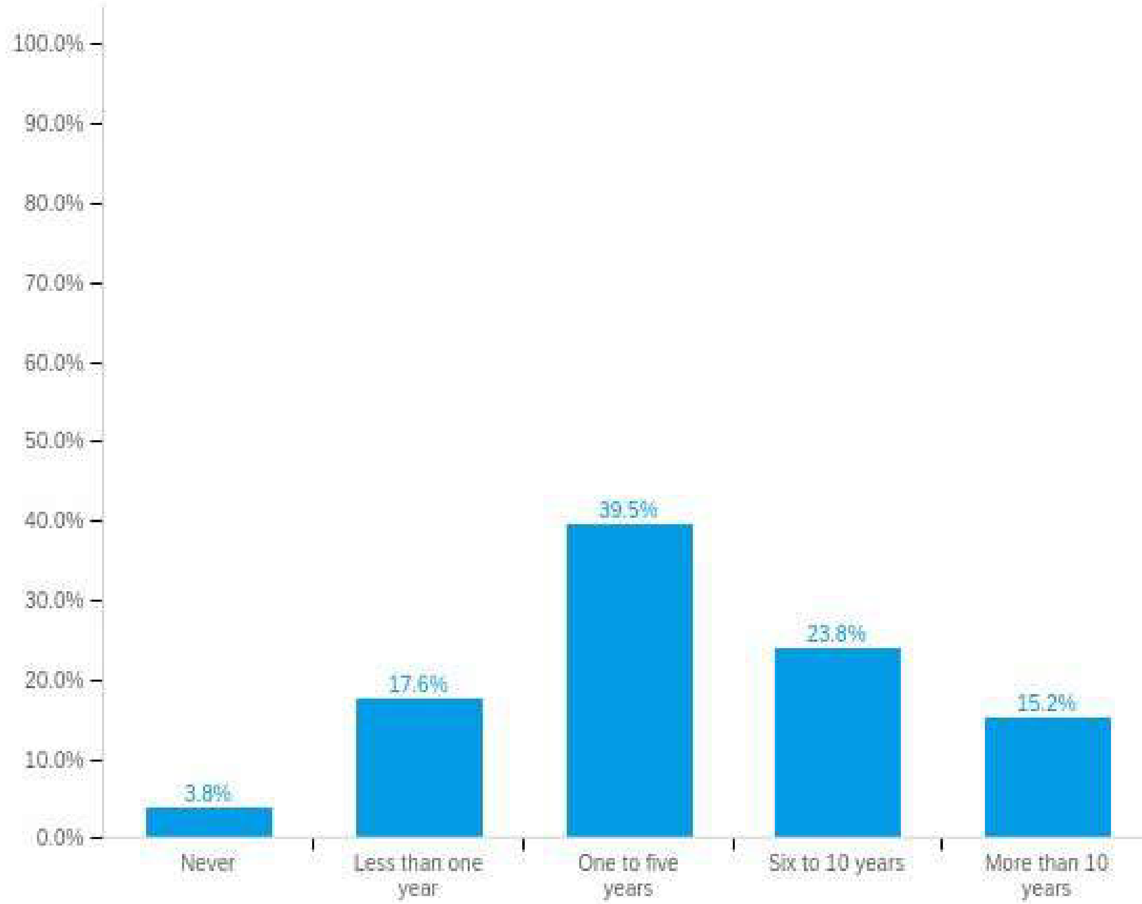
Answer	%	Count
Sustained overvoltage	18.6%	131
Voltage surge (spike, transient)	23.9%	168
External sources (utility, indirect lightning strike)	17.2%	121
Direct lightning strike	15.9%	112
Motor starts/stops or load switching	10.7%	75
Overload caused by operating equipment above full-load rating	13.5%	95
None of these	0.3%	2
Total	100%	704

Which of the following do you believe provide surge protection? [select all that apply]



Answer	%	Count
Surge protective devices (SPD)	24.4%	177
Transient voltage surge suppressors (TVSS)	14.9%	108
Fuses and breakers	17.4%	126
Consumer uninterruptable power supplies (UPS)	8.7%	63
Ground-fault circuit interrupters (GFCI)	13.3%	96
Properly installed wiring	13.5%	98
Typical power strips	7.6%	55
None of these	0.1%	1
Total	100%	724

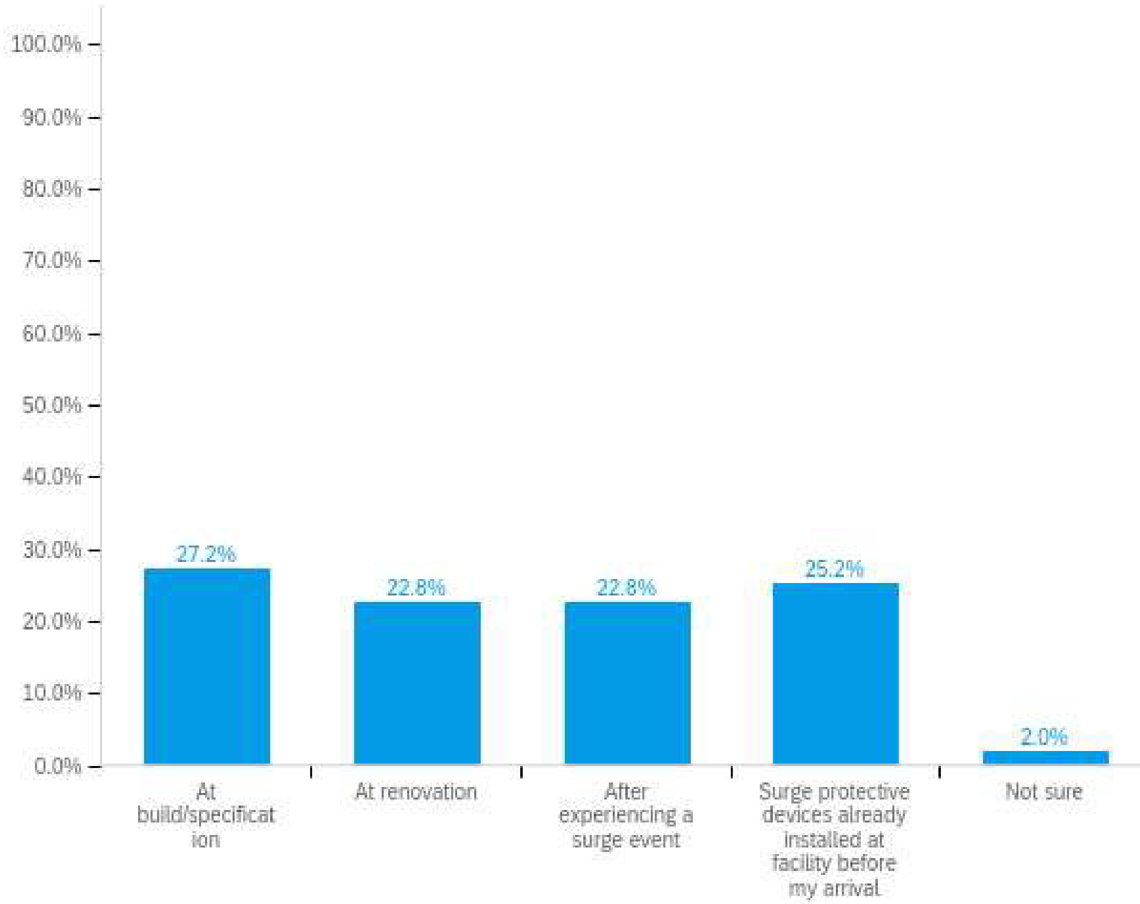
How long has your facility had surge protection technology? [Note: if you manage more than one facility, please answer in terms of the most recent addition of surge protection technology]



Field	Count	Bottom 2 Box	Top 2 Box
How long has your facility had surge protection technology? [Note: if you manage more than one facility, please answer in terms of the most recent addition of surge protection technology]	210	21.4%	39.0%

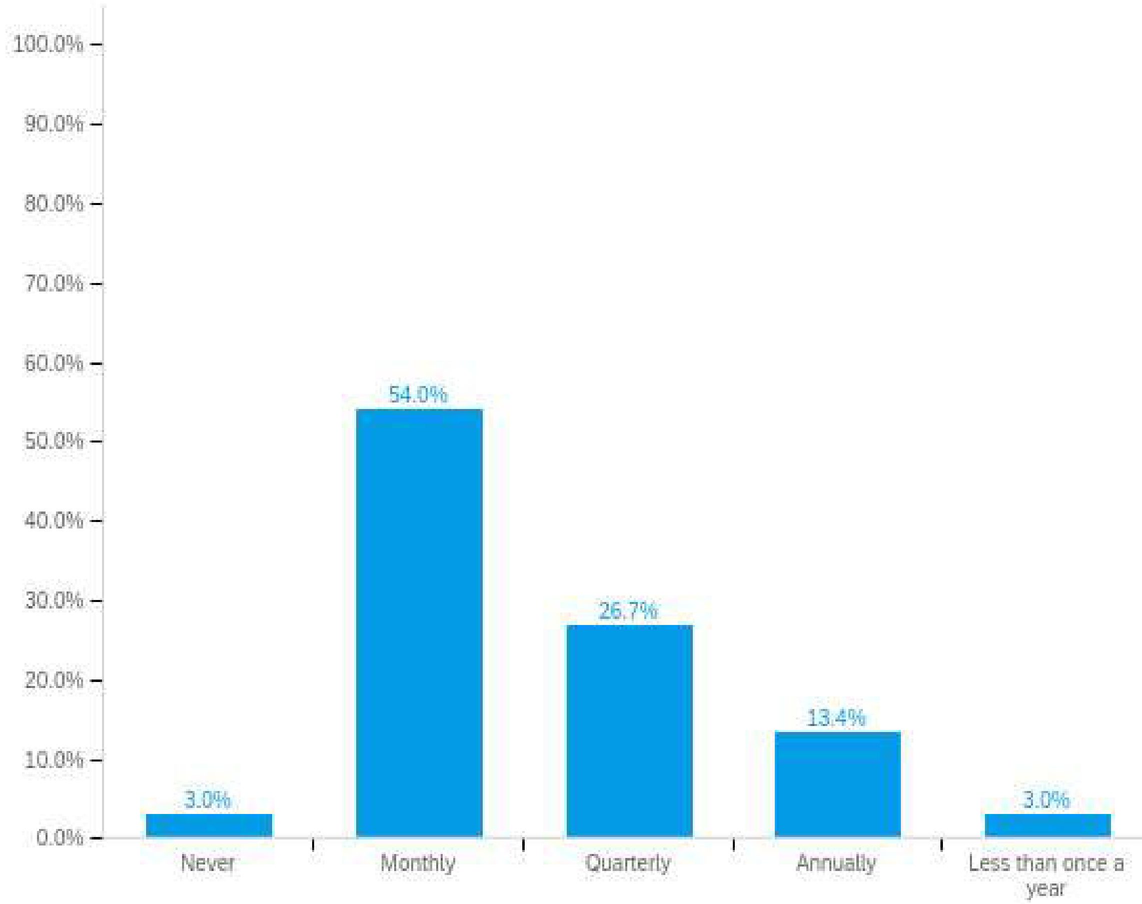
Answer	%	Count
Never	3.8%	8
Less than one year	17.6%	37
One to five years	39.5%	83
Six to 10 years	23.8%	50
More than 10 years	15.2%	32
Total	100%	210

When did you first purchase surge protective devices for your facility?



Answer	%	Count
At build/specification	27.2%	55
At renovation	22.8%	46
After experiencing a surge event	22.8%	46
Surge protective devices already installed at facility before my arrival	25.2%	51
Not sure	2.0%	4
Total	100%	202

How frequently do you have your surge protective devices inspected/tested?



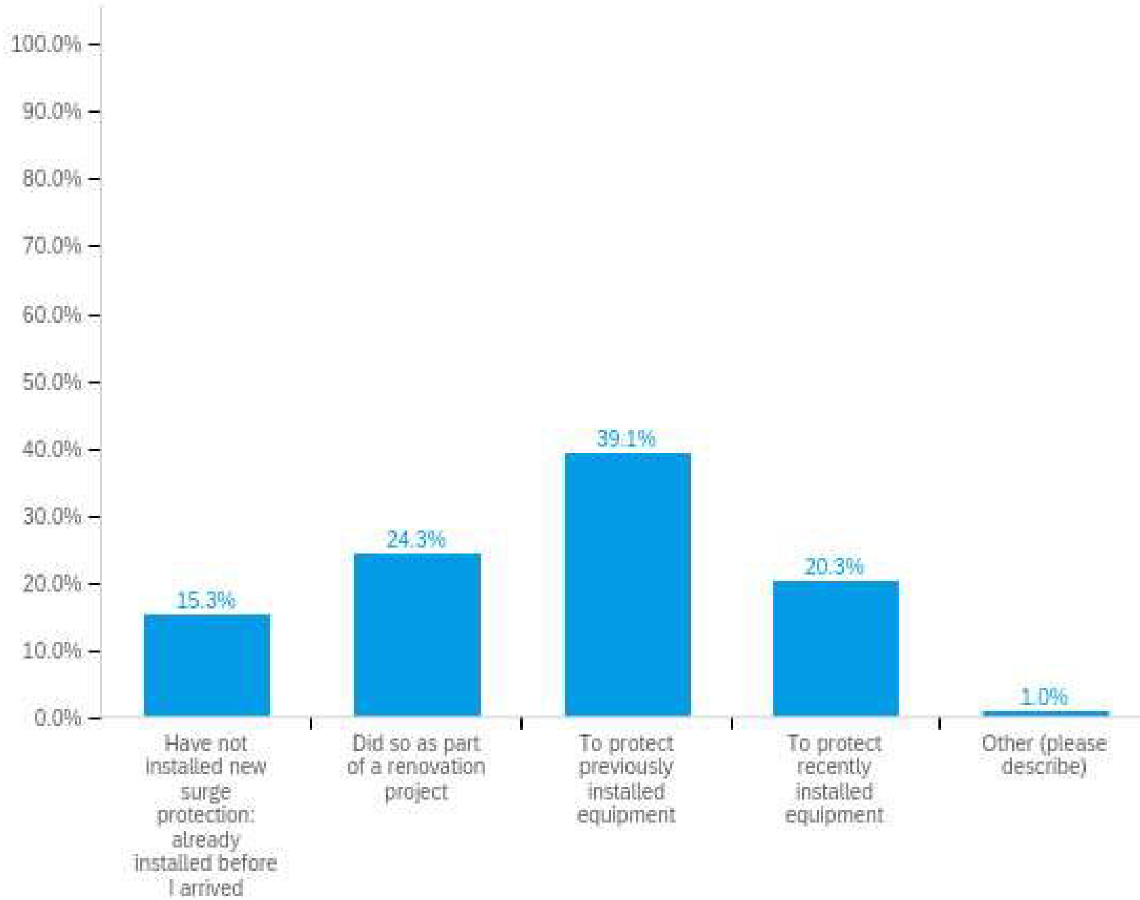
Field	Count	Bottom 2 Box	Top 2 Box
How frequently do you have your surge protective devices inspected/tested?	202	56.9%	16.3%

Answer	%	Count
Never	3.0%	6
Monthly	54.0%	109
Quarterly	26.7%	54
Annually	13.4%	27
Less than once a year	3.0%	6
Total	100%	202

Is inspection/testing of your facility's surge protective devices part of your overall routine maintenance/inspection plan?

Answer	%	Count
Yes	94.4%	185
No	5.6%	11
Total	100%	196

What is the main reason why you chose to install surge protection in your facility?



Answer	%	Count
Have not installed new surge protection: already installed before I arrived	15.3%	31
Did so as part of a renovation project	24.3%	49
To protect previously installed equipment	39.1%	79
To protect recently installed equipment	20.3%	41
Other (please describe)	1.0%	2
Total	100%	202

"Other" response:

- Maintain all operations

Please describe any surge protection successes at your facility.

- Reduce faults by 50%
- surge protector protecting my electronics device from random power spike damage.
- It helps me to increase the useful life of my equipment, and to protect the saved data and avoid great damage
- It has helped us tremendously protect our electrical devices. We can tell a big difference in operations with no blinking lights or power surges.
- Protection of electrical tools
- The addition of the surge protection device was effective in maintaining the integrity of the equipment
- we have frequent power outages, we have several computers and electronic devices so it is important for us to protect our equipment
- breakers successfully shut off due to over heating
- It has faced a very good reaction from people where I work, and helped to reduce the damage of the machines and the electricity as a whole
- surge protection and hardware shortage protection
- The effect of the lightning was avoided
- Several devices were rescued from the danger of lightning
- This contributed to support the machines and reduce damage
- It's almost impossible to imagine a modern building without heating and air conditioning
- It has successfully protected all machines from overload with this protection, which is a great achievement
- It makes us feel more safe during any unexpected types of electric issues
- protect the machines from sudden surges
- not to be exposed to any dangers
- There is a very high protection ratio.
- to be more safe
- Never needed yet
- We haven't had any issues as of yet.
- During thunder storm and lightning hit nearby
- I remember using Teckin Smart power strip
- The risk of an accident is reduced.
- Have had many overloads due to storm damage, was able to be 100% operational with no damage to equipment
- surge protectors on computers and overall protection on inverters
- there were a few hurricanes and the power went out but due to surge protection business was not interrupted
- protect machine from damage
- protection from breakdowns and increase in productivity
- My company is protected from electrical overloads and lightning strikes
- Increased facility protection from lightning strikes
- No interruption of service during any snowstorm or weather event.
- UPS is best for surge protection
- electromagnetic interference/radio-frequency interference (EMI/RFI)

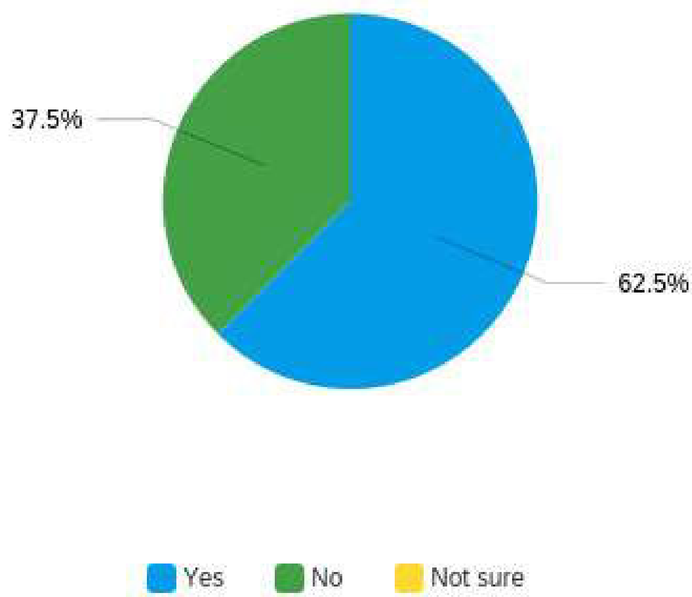
- We are in an area where lightning is very common. I do not know how many times lightning has struck peoples cars, Trucks and even our main power transformer, we were out of power for almost 3 hours, This was a common occurrence. Now, Since we put protection in place to fight back. We have not had any problems. Now peoples cars still get hit on the way in. We are in a very secluded industrial area.
- protection from high tension as a result of lightning
- we got no damage.
- We have not had any problems with the power being out against the surge.
- I think my company have all electrical security that we need
- nothing comes to mind at the moment...a protection success means that i wouldn't know if a surge protection was successful or not!
- Our surge protector saved our servers from a lightning strike to a local transformer
- correctly install electrical wiring and add circuit breakers regularly
- so far we have been protected during large storms
- Haven't had an episode yet.
- Protection of people and equipment
- I haven't seen any increase in the electric current since I started working
- keep electrical circuits from sabotage
- there is a lot of protection in my facility and we take a good care of it
- the company's electrical network has been successfully protected
- Our local power company had cut wires by our building and we experienced a brown out, I think it worse than when the power is completely out.
- We use this protection on all circuit s involving a our electronics with very good success.
- Fears of over current at the facility were mitigated.
- We were able to curb power surge spikes
- The organizers did not experience any malfunctions due to the installation of the heating devices
- Electricity regulator that raises the voltage and protects the machines from different frequencies
- A POWER GRID SURGE WAS AVOIDED AND DAMAGE TO MFG EQUIPMENT
- We’ve had great success in keeping our breaker boxes clear and easy to get to, maintaining electric outlets, and provide surge protectors for outlets with multiple cords.
- THE facility was hit by a lightning bolt and passed it successfully with surge protection
- Surge protection has been of help ever since it was installed after experiencing power outage caused by lightning few years ago which led to some equipment to become faulty. But since the installation of the surge protection, power as been smooth and not affected by high voltage
- We have had zero problems with power surges so we must be doing something right
- Surge protection success was goal reached for our company
- We have not experienced any damage
- Some of the devices in the company were exposed to an increase in the current, which leads to an increase in our anxiety, but now it is safer
- there is no damage in storms
- The last one that happened, if not for my surge protector, it would have destroyed my laptop
- When it happens or lightning as well as when loading the overload because of the large use of electricity and has been successfully protected and envious
- We have had no incidents to speak of

- Significantly reduce electrical failures... Power to meet the needs of the plant
- Back in 2019 we had a winter storm the winds were very heavy also was raining and then all of a sudden loss direct power but instantly because of the newly installed system we have we're up and running in less than 10 minutes
- We had a lightning strike that tripped a breaker preventing a blowout
- In the winter when we use more heating lamps for patio dining, the surge protection prevents sudden power shut-offs to some electrical outlets.
- It has saved all the computers several times.
- There was a time there was a high voltage and rather than affect the main equipment, it only affected the surge protectors.
- Protection of facility equipment from lightning strikes and increased efforts
- A large thunder and rainstorm came rolling through the area and directly at my facility. Lightning struck the building twice and the surge protectors came instantly into use and saved all our hardware and software
- Bad storms and lightning and still good power.
- That is classified information
- At breaker box and monitored by 3rd party remotely.
- We had lightning hit our building and our protectors worked.
- Thunderbolt protection
- over voltage protection, rain and lightning surge
- We’ve had some of our equipment saved from being fried with our surge protection equipment.
- lighting struck and nothing happened
- The electric current has been kept stable
- We have protection over all areas
- Differential protection
- The use of electrical regulator machines
- Protect devices from damage
- Last months we had a snowstorm and some cables came down In one of the buildings so the surge protection shutdown quickly preventing any hazards
- CNC Transient Surge & Lightning Protection
- success has been achieved in protecting the devices in my company from damage
- the dampers have helped protect may computers and thus the property of the facility
- all attempts
- no need to use it yet
- there was an outage due to an recent storm and the surge came in handy
- Back in 2019 during the blackout our company's surge protection protected our equipment and maintained the company's safety.
- We have had no outages in last five years since we went though a thorough evaluation.
- Power system recovery facility.
- made a surge protection for my office & it was successfully done.
- Minimizing faults as much as possible and causing contact that causes great danger to electrical devices
- yes we did an upgrade and prevented unexpected power cuts
- We dealt with a huge outage of 5 year mechanical devices and the update Took place early December and we haven’t had outages since.

- by having it installed it protected all of our equipment from recent severe lightning storms.
- Sandy storm, it helped turn all equipment off safely
- we got enough backup that i don’t gotta worry about any problems
- Lightning hit and it worked
- Surge protection has definitely protected our facility multiple times throughout the years
- Power has not went out since installing it
- We have had times where printers at registers could have burned up but the surge protectors did their job
- When the winter storm hit Texas and the power was intermittent.
- A few months earlier a voltage surge was prevented by the preventive technology which was due to faulty wiring and over voltage issue.
- Do to hurricane our building lost power but we had emergency lights and none of our equipment was damaged when the power went out.
- The surge protection of success at our facility is very important to use ore CVS current provider
- We have never had any spikes due to the perfectly installed surge protection.
- Maintaining complete equipment and constant reassurance that there are no dangers
- Surge protectors
- It's been great saving my equipment in many ways.
- None needed
- Less power surges, more stable output
- When lighting struck during a hurricane, the equipment was still protected
- UPS backed up Server rooms
- I did a surge protection success at my facility
- Had power interruption during storm which could have caused damage to machinery
- High voltage machine shop
- It was installed after we had a lightning hit and damaged all of out equipment 3 years ago
- Some of the surge protection we've had covers and protects from power surges and such because the electrical wiring
- We use them to prevent from voltage strikes and completely crisp down our hardware
- It re-routes the voltage when voltage is more than enough
- We have not had any tech fires in 2 years. Everything is protected and our breaker trip system is top notch
- We have prevent surges and outages by having surge protections

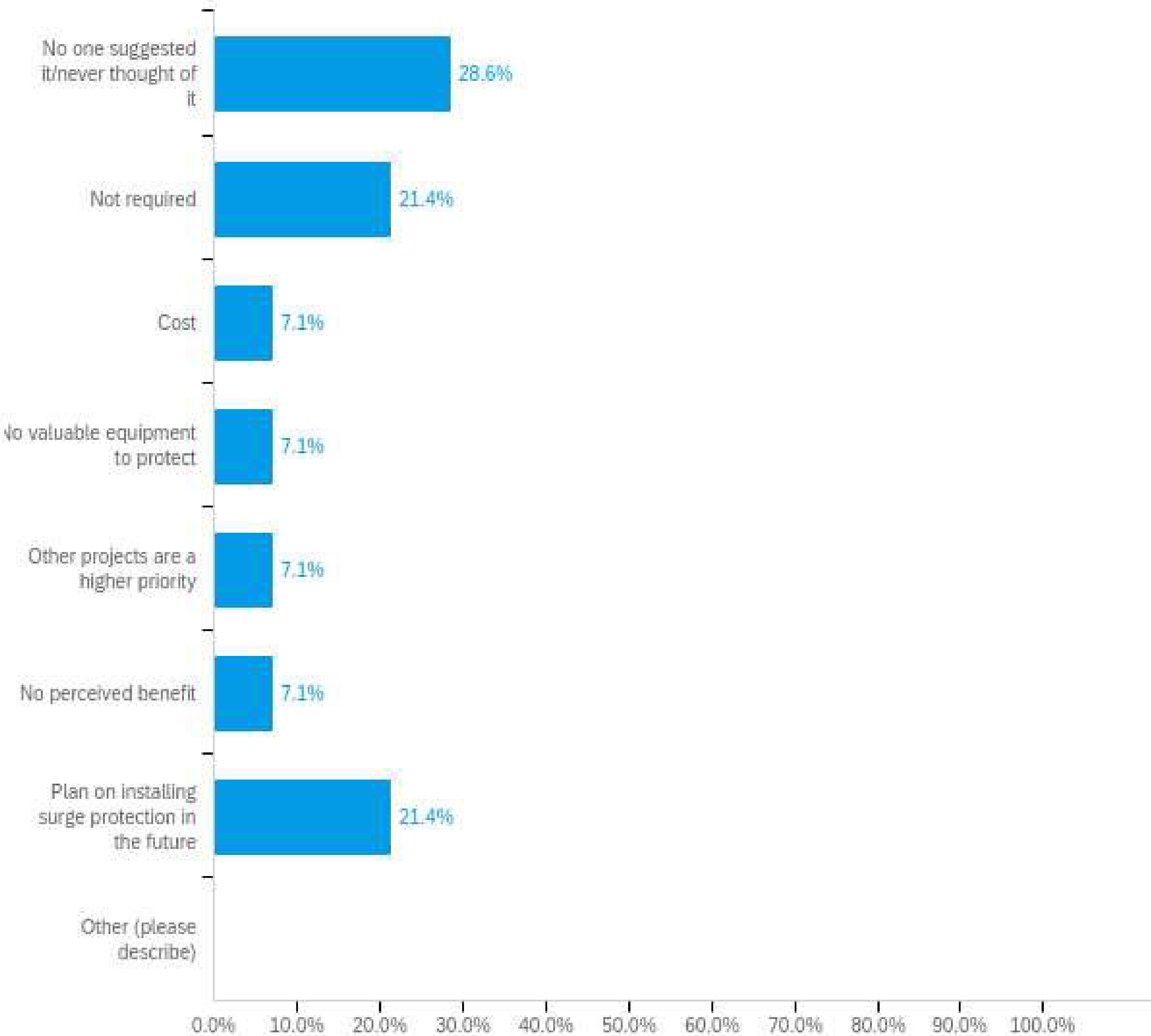
Please describe any surge protection successes at your facility. Words most frequently used by respondents:

Has surge protection been recommended for your facility?



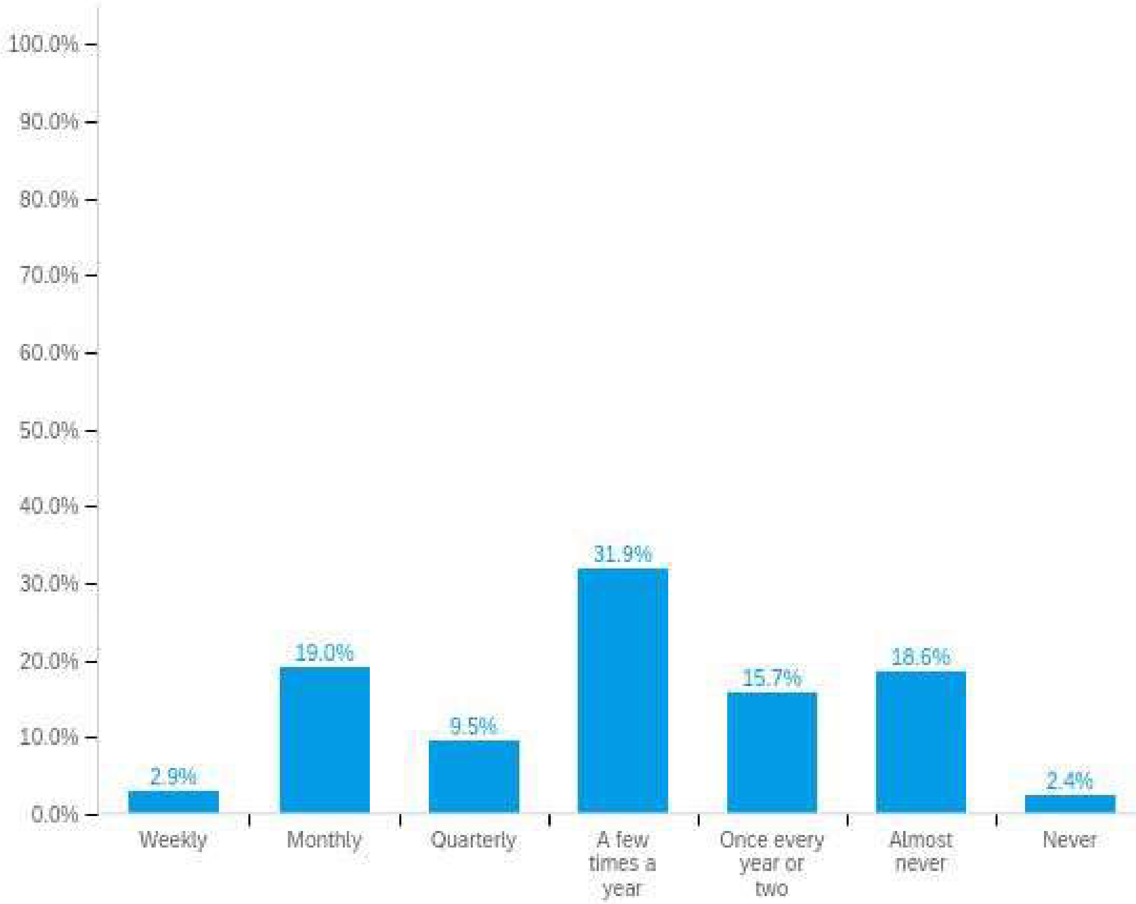
Answer	%	Count
Yes	62.5%	5
No	37.5%	3
Not sure	0.0%	0
Total	100%	8

Why did you decide not to have surge protective devices installed in your facility? [select all that apply]



Answer	%	Count
No one suggested it/never thought of it	28.6%	4
Not required	21.4%	3
Cost	7.1%	1
No valuable equipment to protect	7.1%	1
Other projects are a higher priority	7.1%	1
No perceived benefit	7.1%	1
Plan on installing surge protection in the future	21.4%	3
Other (please describe)	0.0%	0
Total	100%	14

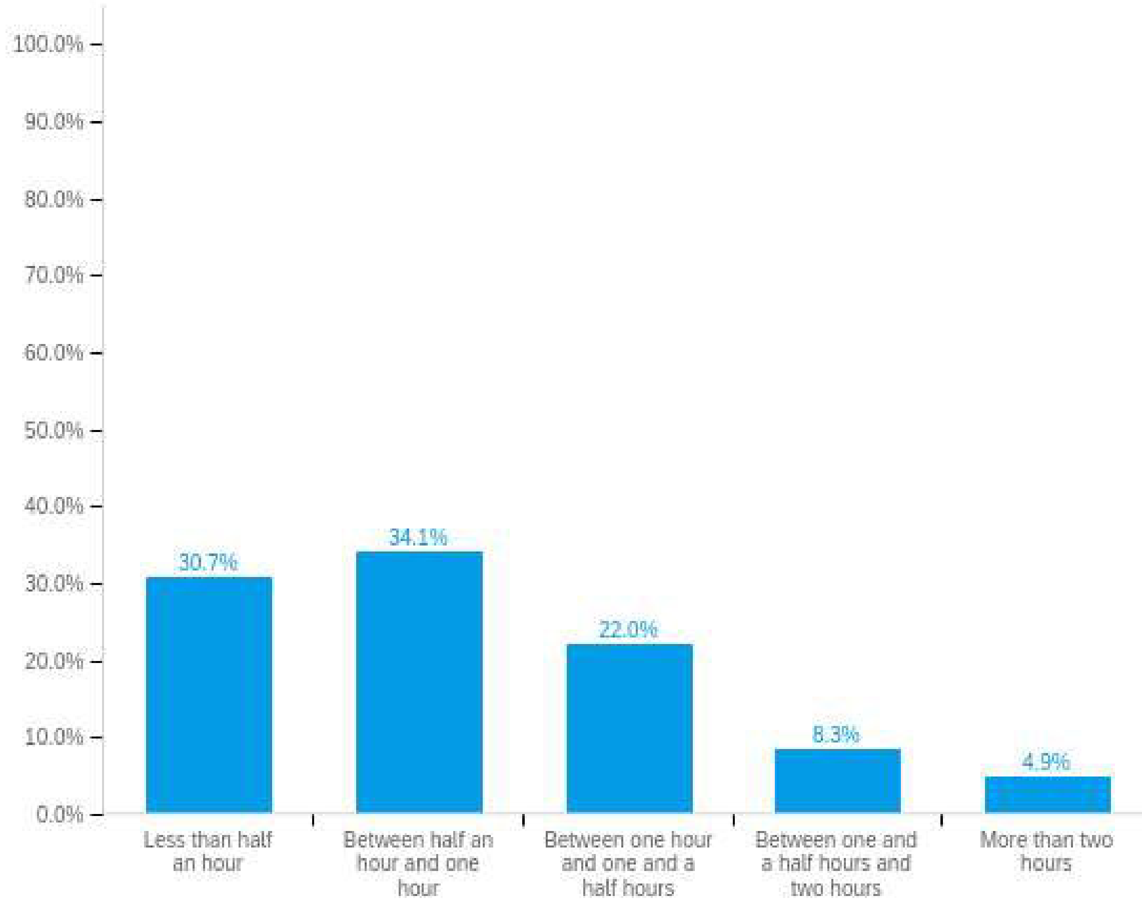
How often does your facility experience unplanned downtime from any cause?



Field	Count	Bottom 2 Box	Top 2 Box
How often does your facility experience unplanned downtime from any cause?	210	21.9%	21.0%

Answer	%	Count
Weekly	2.9%	6
Monthly	19.0%	40
Quarterly	9.5%	20
A few times a year	31.9%	67
Once every year or two	15.7%	33
Almost never	18.6%	39
Never	2.4%	5
Total	100%	210

When it occurs, how long is your facility typically affected by unexpected downtime?



Field	Count	Bottom 2 Box	Top 2 Box
When it occurs, how long is your facility typically affected by unexpected downtime?	205	64.9%	13.2%

Answer	%	Count
Less than half an hour	30.7%	63
Between half an hour and one hour	34.1%	70
Between one hour and one and a half hours	22.0%	45
Between one and a half hours and two hours	8.3%	17
More than two hours	4.9%	10
Total	100%	205

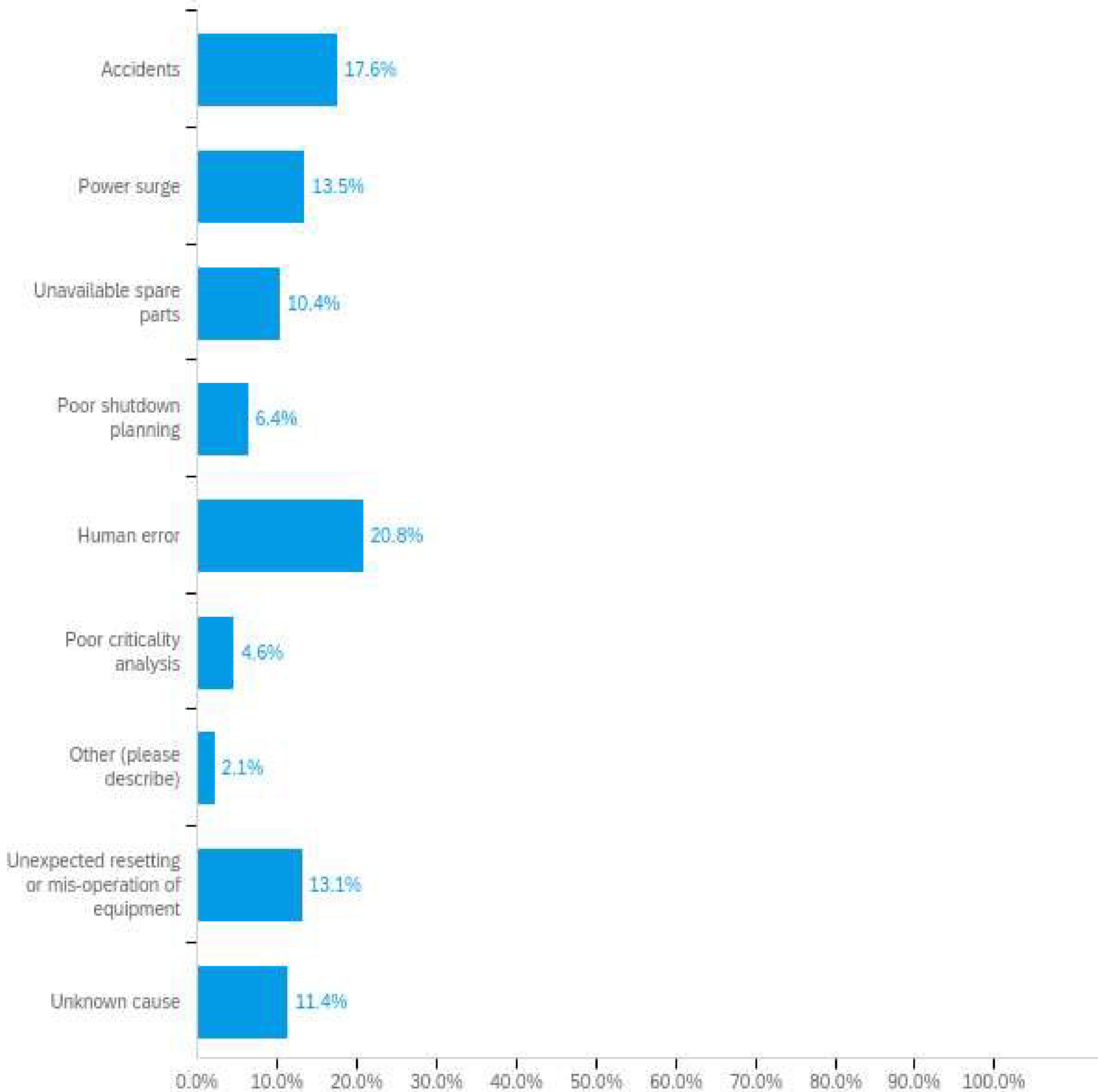
What would you estimate was the total yearly cost to your facility because of unplanned downtime in a typical year? [Please answer in terms of U.S. Dollars. Use numbers only, no punctuation]

Field	Mean	Std Deviation	Count
What would you estimate was the total yearly cost to your facility because of unplanned downtime in a typical year? [Please answer in terms of U.S. Dollars. Use numbers only, no punctuation]	666670.4	7032559.7	205

What would you estimate the cost per hour is to your facility because of unplanned downtime? [Please answer in terms of U.S. Dollars. Use numbers only, no punctuation]

Field	Mean	Std Deviation	Count
What would you estimate the cost per hour is to your facility because of unplanned downtime? [Please answer in terms of U.S. Dollars. Use numbers only, no punctuation]	16022.7	78357.3	205

What events have caused unplanned downtime at your facility? [select all that apply]

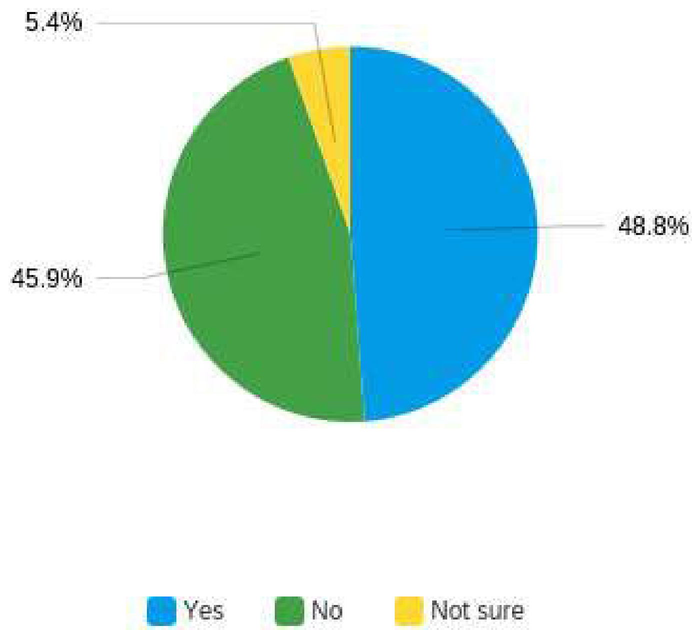


Answer	%	Count
Accidents	17.6%	91
Power surge	13.5%	70
Unavailable spare parts	10.4%	54
Poor shutdown planning	6.4%	33
Human error	20.8%	108
Poor criticality analysis	4.6%	24
Other (please describe)	2.1%	11
Unexpected resetting or mis-operation of equipment	13.1%	68
Unknown cause	11.4%	59
Total	100%	518

“Other” responses:

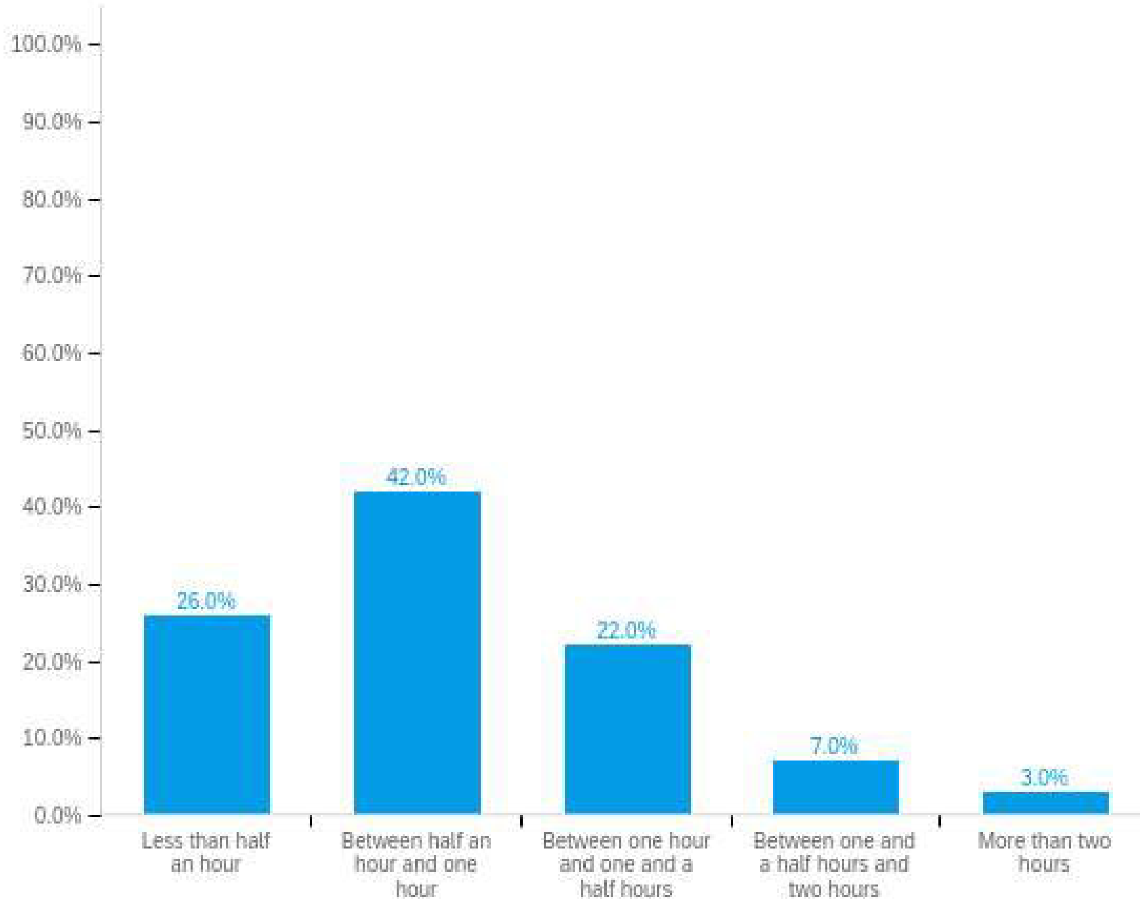
- power company
- Power shutdown
- hot weather
- natural disaster
- Weather (x3)
- Winter storm
- Grid
- The SCE faulty equip
- n/a

Within the last 12 months, has your facility experienced unplanned downtime caused by a power surge?



Answer	%	Count
Yes	48.8%	100
No	45.9%	94
Not sure	5.4%	11
Total	100%	205

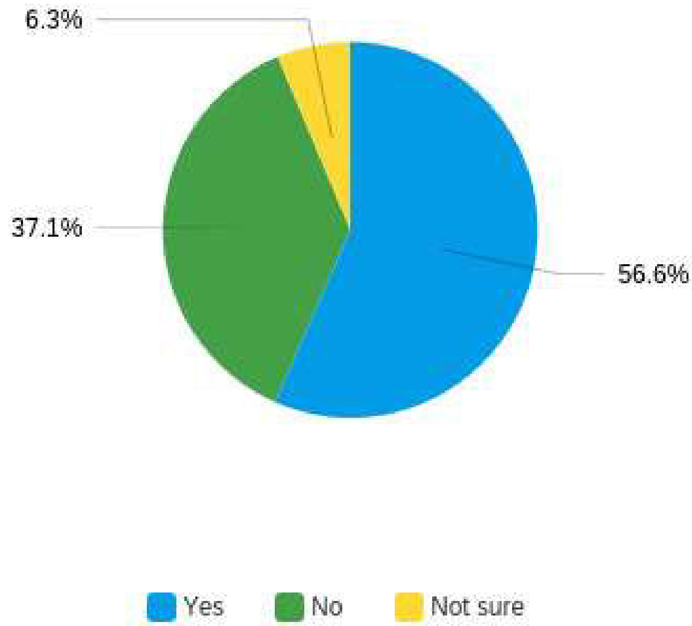
How long did the most recent downtime incident caused by a power surge at your facility last?



Field	Count	Bottom 2 Box	Top 2 Box
How long did the most recent downtime incident caused by a power surge at your facility last?	100	68.0%	10.0%

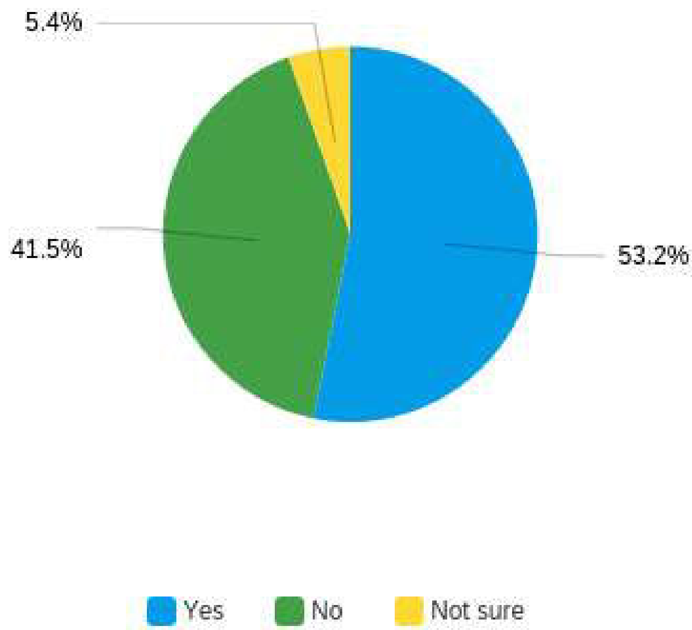
Answer	%	Count
Less than half an hour	26.0%	26
Between half an hour and one hour	42.0%	42
Between one hour and one and a half hours	22.0%	22
Between one and a half hours and two hours	7.0%	7
More than two hours	3.0%	3
Total	100%	100

Has your facility experienced a voltage surge that resulted in an equipment restart or mis-operation?



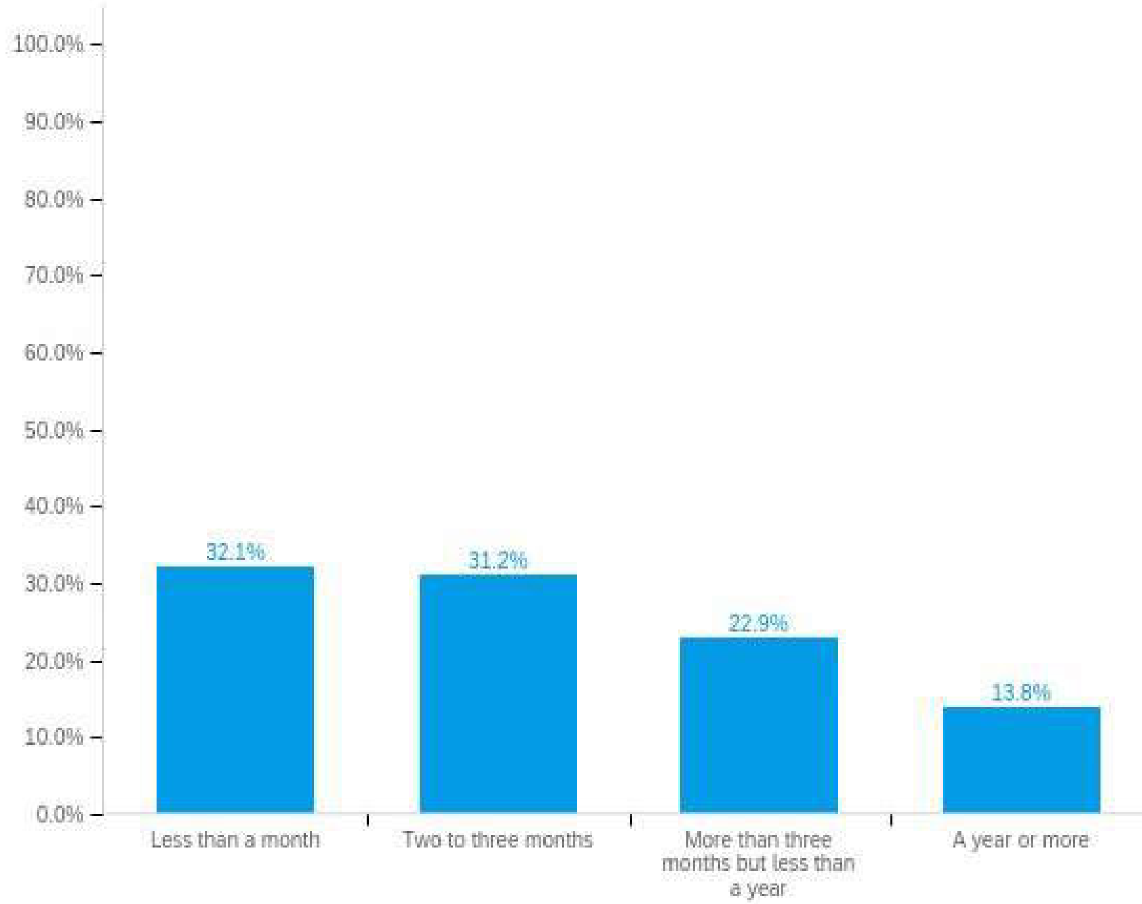
Answer	%	Count
Yes	56.6%	116
No	37.1%	76
Not sure	6.3%	13
Total	100%	205

Has your facility experienced a voltage surge that caused a power outage or equipment failure?



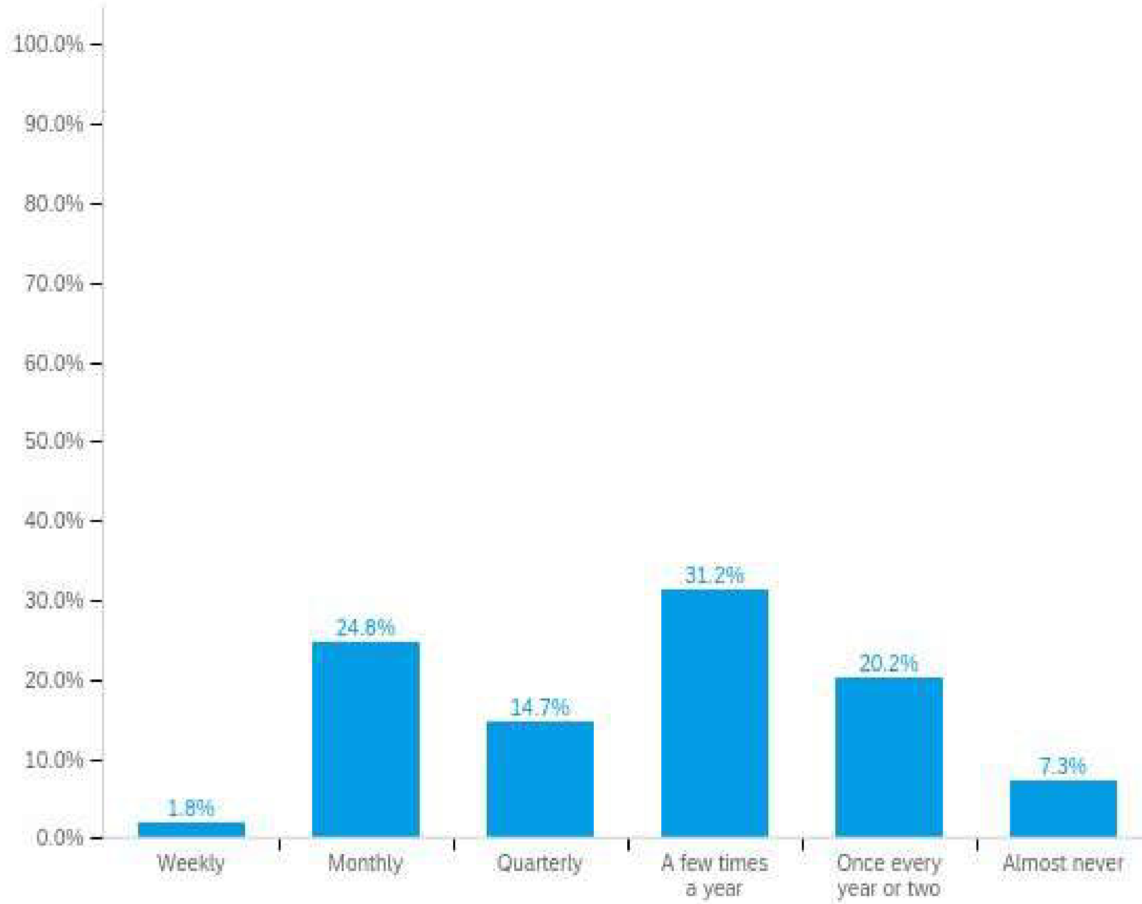
Answer	%	Count
Yes	53.2%	109
No	41.5%	85
Not sure	5.4%	11
Total	100%	205

How recently did your facility experience a voltage surge?



Answer	%	Count
Less than a month	32.1%	35
Two to three months	31.2%	34
More than three months but less than a year	22.9%	25
A year or more	13.8%	15
Total	100%	109

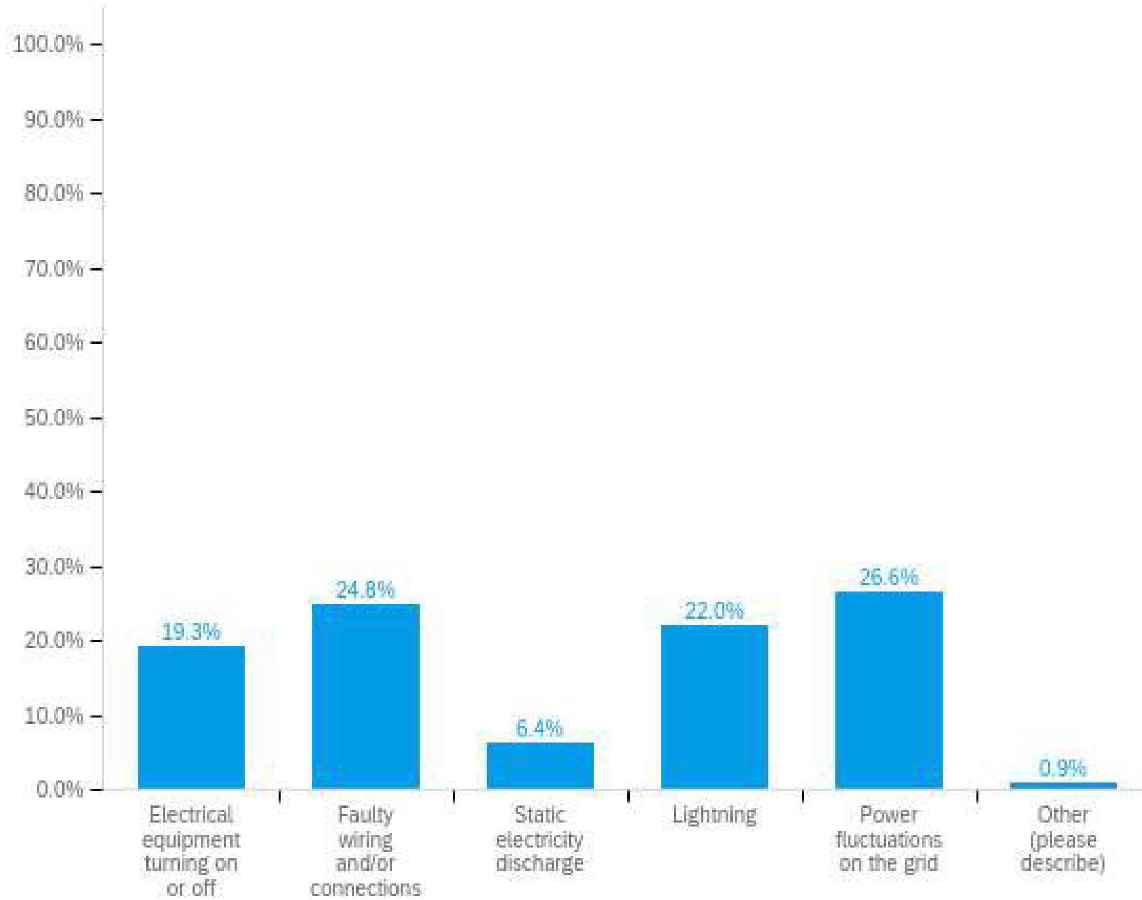
How often does your facility experience voltage surges?



Field	Count	Bottom 2 Box	Top 2 Box
How often does your facility experience voltage surges?	109	26.6%	27.5%

Answer	%	Count
Weekly	1.8%	2
Monthly	24.8%	27
Quarterly	14.7%	16
A few times a year	31.2%	34
Once every year or two	20.2%	22
Almost never	7.3%	8
Total	100%	109

What has been the most common cause of voltage surges within your facility?



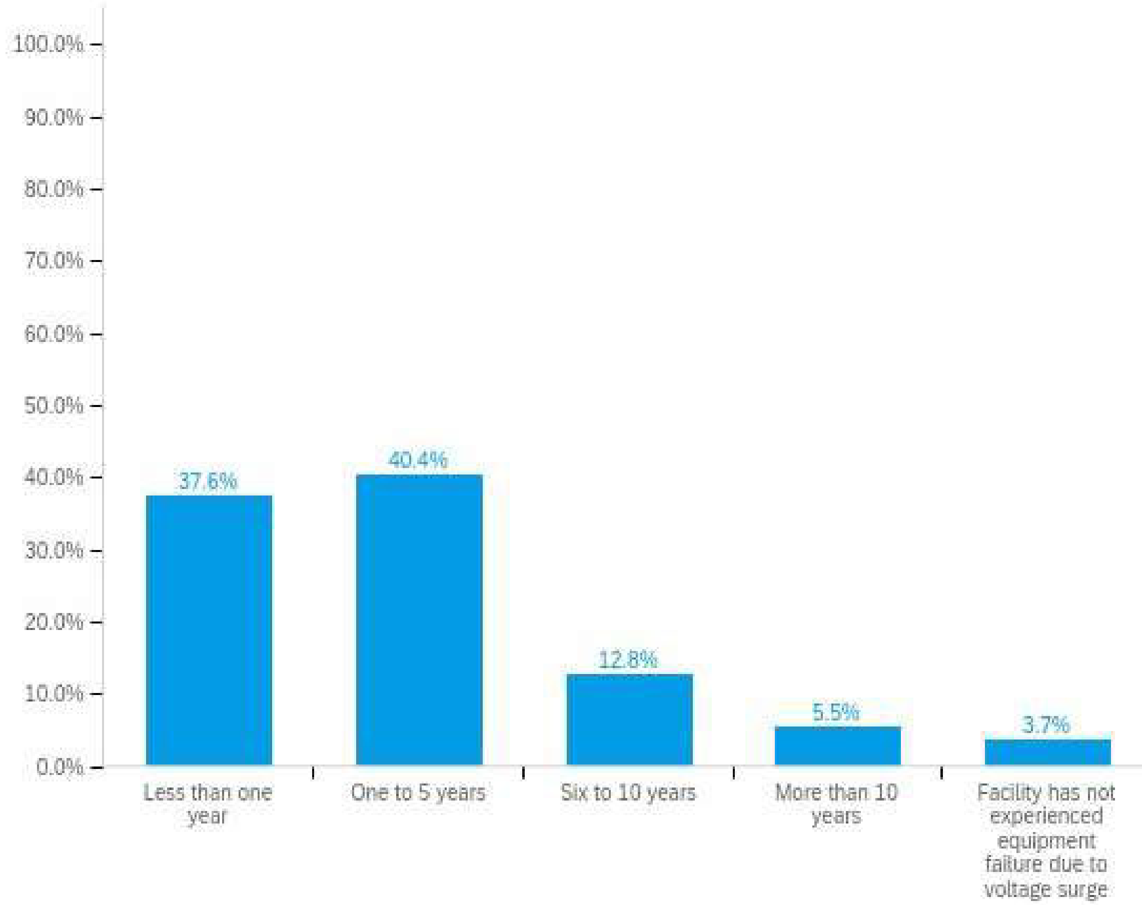
Answer	%	Count
Electrical equipment turning on or off	19.3%	21
Faulty wiring and/or connections	24.8%	27
Static electricity discharge	6.4%	7
Lightning	22.0%	24
Power fluctuations on the grid	26.6%	29
Other (please describe)	0.9%	1
Total	100%	109

Other (please describe) - Text
hot weather

Dragging the sliders below, estimate the percentage of voltage surges affecting your facility that have been caused by factors outside of your facility versus those that have been caused by factors inside your facility. [Note: total will automatically equal 100%]

Field	Mean	Count
Outside my facility	59.5	108
Inside my facility	40.5	108

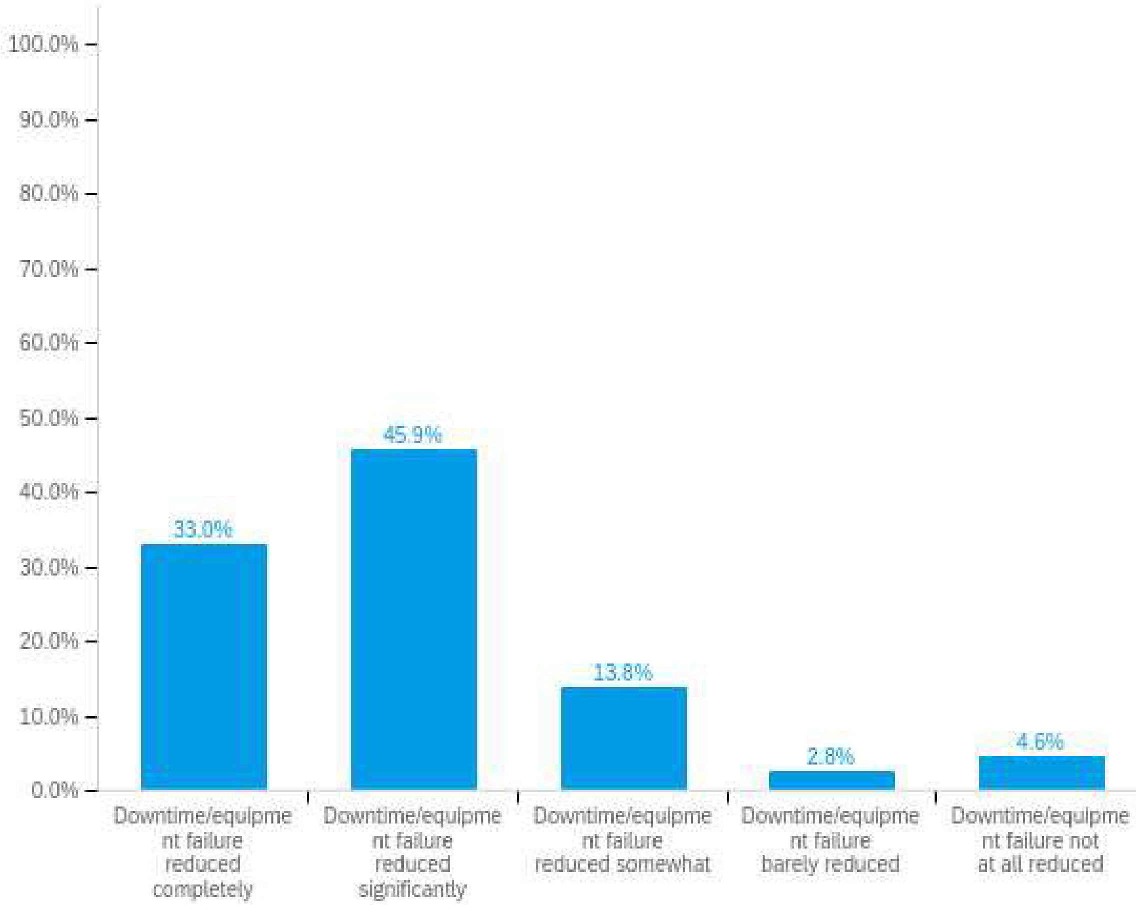
In the most recent case of equipment failure due to voltage surge at your facility, how long had the device that failed been in service?



Field	Count	Bottom 2 Box	Top 2 Box
In the most recent case of equipment failure due to voltage surge at your facility, how long had the device that failed been in service?	109	78.0%	9.2%

Answer	%	Count
Less than one year	37.6%	41
One to 5 years	40.4%	44
Six to 10 years	12.8%	14
More than 10 years	5.5%	6
Facility has not experienced equipment failure due to voltage surge	3.7%	4
Total	100%	109

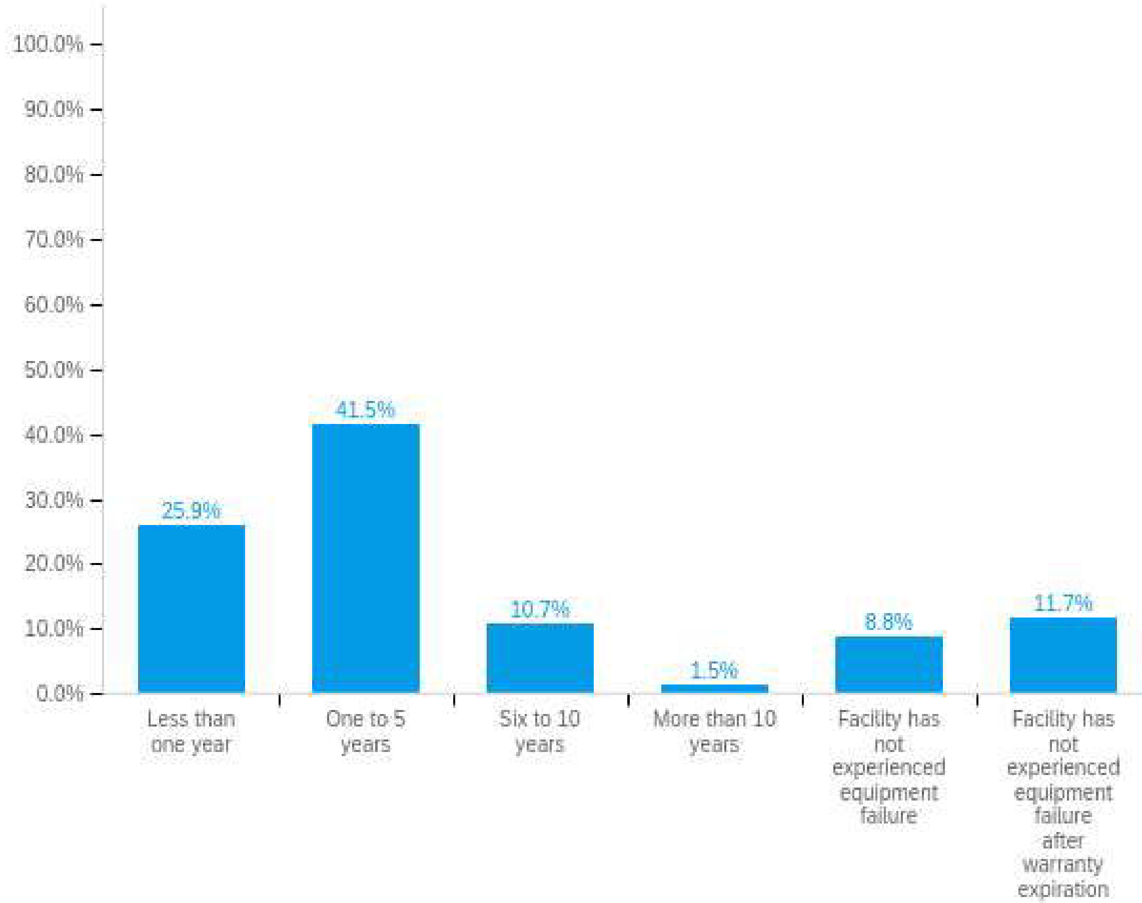
How much would you say the installation of surge protective devices has cut down on the amount of downtime/equipment failure at your facility?



Field	Count	Bottom 2 Box	Top 2 Box
How much would you say the installation of surge protective devices has cut down on the amount of downtime/equipment failure at your facility?	109	78.9%	7.3%

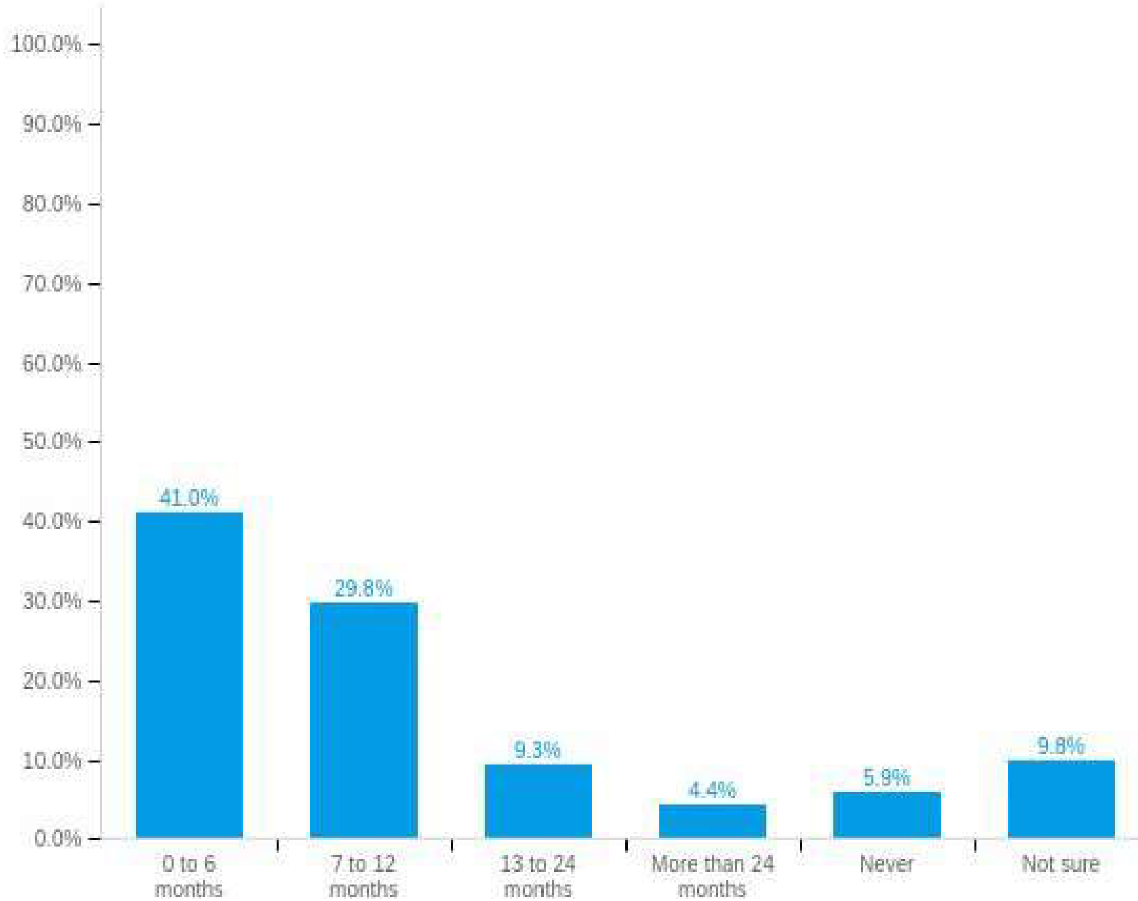
Answer	%	Count
Downtime/equipment failure reduced completely	33.0%	36
Downtime/equipment failure reduced significantly	45.9%	50
Downtime/equipment failure reduced somewhat	13.8%	15
Downtime/equipment failure barely reduced	2.8%	3
Downtime/equipment failure not at all reduced	4.6%	5
Total	100%	109

In the most recent case in which equipment failed at your facility -- for any reason -- how long after warranty expiration did the failure occur?



Answer	%	Count
Less than one year	25.9%	53
One to 5 years	41.5%	85
Six to 10 years	10.7%	22
More than 10 years	1.5%	3
Facility has not experienced equipment failure	8.8%	18
Facility has not experienced equipment failure after warranty expiration	11.7%	24
Total	100%	205

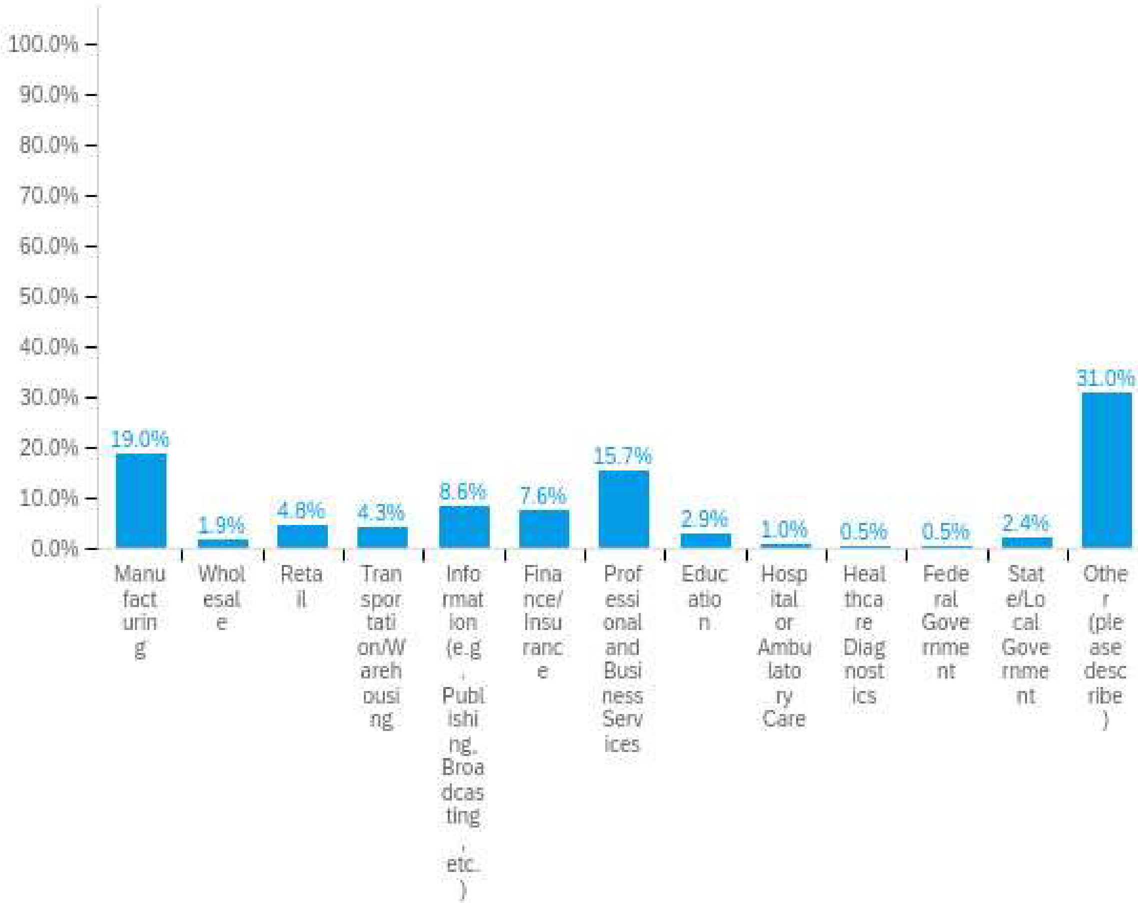
When was the last time you performed a resistance reading on your facility's grounding system?



Field	Count	Bottom 2 Box	Top 2 Box
When was the last time you performed a resistance reading on your facility's grounding system?	205	70.7%	15.6%

Answer	%	Count
0 to 6 months	41.0%	84
7 to 12 months	29.8%	61
13 to 24 months	9.3%	19
More than 24 months	4.4%	9
Never	5.9%	12
Not sure	9.8%	20
Total	100%	205

From the following list, please select the primary business function of the facilities you manage.



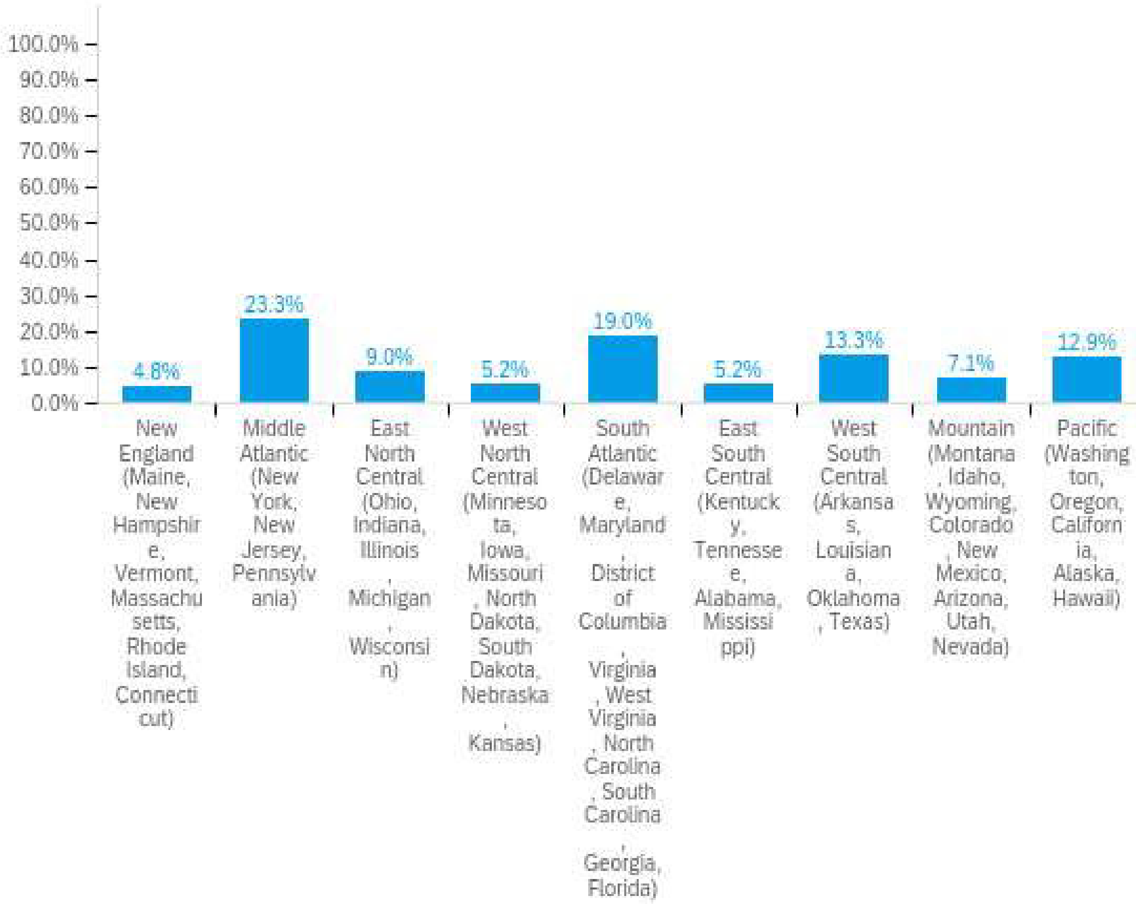
Answer	%	Count
Manufacturing	19.0%	40
Wholesale	1.9%	4
Retail	4.8%	10
Transportation/Warehousing	4.3%	9
Information (e.g. Publishing, Broadcasting, etc.)	8.6%	18
Finance/Insurance	7.6%	16
Professional and Business Services	15.7%	33
Education	2.9%	6
Hospital or Ambulatory Care	1.0%	2
Healthcare Diagnostics	0.5%	1
Physician Office	0.0%	0
Federal Government	0.5%	1
State/Local Government	2.4%	5
Other (please describe)	31.0%	65
Total	100%	210

Most frequently used "Other" responses:

What is the approximate total square footage of the facility or facilities you manage?

Field	Mean	Std Deviation	Count
What is the approximate total square footage of the facility or facilities you manage?	29316.9	121170.3	210

In what region of the United States are you located?



Answer	%	Count
New England (Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut)	4.8%	10
Middle Atlantic (New York, New Jersey, Pennsylvania)	23.3%	49
East North Central (Ohio, Indiana, Illinois, Michigan, Wisconsin)	9.0%	19
West North Central (Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, Kansas)	5.2%	11
South Atlantic (Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida)	19.0%	40
East South Central (Kentucky, Tennessee, Alabama, Mississippi)	5.2%	11
West South Central (Arkansas, Louisiana, Oklahoma, Texas)	13.3%	28
Mountain (Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada)	7.1%	15
Pacific (Washington, Oregon, California, Alaska, Hawaii)	12.9%	27
Total	100%	210

Public Input No. 2912-NFPA 70-2023 [Section No. 215.18(A)]

(A) Surge-Protective Device.

Where a feeder that originates in service equipment, the source of a separately derived system, other power supply source, or other down stream distribution equipment, and supplies any of the following, a surge-protective device (SPD) shall be installed:

(1) Dwelling units

(2) Dormitory units

(3) Guest rooms and guest suites of hotels and motels

(4) Areas of nursing homes and limited-care facilities used exclusively as patient sleeping rooms

Exception: SPD's are not required for feeders that supply only HVAC equipment, pool equipment or electric water heaters.

Statement of Problem and Substantiation for Public Input

It is unclear where it is intended install the SPD's. The definition of feeder starts off with "All circuit conductors (between) the service equipment... and the final over-current device". For dwellings in particular using a strict interpretation of between vs originates could lead to SPD's being required at any location that has a sub-panel that contains circuit breakers. For example exterior sub-panel for HVAC or pool equipment. This could also present problems for an attic air-handler that has built in breakers. This would unfortunately rule out the need for a SPD in a sub-panel that is fed from another sub-panel. For example the service has a feeder that goes into a garage sub-panel and from there several feeders go to different sub-panel locations in the dwelling unit. Since the SPD's work best when located in close proximity to the over-current devices It may be necessary to reword this section to allow for this possibility.

Submitter Information Verification

Submitter Full Name: Ronald Dalrymple
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Street Address:
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Zip:
Submittal Date: Sat Aug 26 18:19:00 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The revised language is not necessary. It doesn't matter where the feeder originates, the SPD is still required. The exception is not necessary as the equipment identified is not included in the items 1 – 4.

Public Input No. 3367-NFPA 70-2023 [Section No. 215.18(A)]

(A) Surge-Protective Device.

Where a feeder supplies any of the following, a surge-protective device (SPD) shall be installed:

(1) Dwelling units

(2) Dormitory units

(3) Guest rooms and guest suites of hotels and motels

(4) Areas of nursing homes and limited-care facilities used exclusively as patient sleeping rooms

(5) Areas designed for use exclusively as sleeping quarters in fire stations, police stations, ambulance stations, rescue stations, ranger stations, and similar locations

Statement of Problem and Substantiation for Public Input

Surge protection was included in the 2020 NEC to address the recognized need for surge protection to protect the sensitive electronics and systems found in most modern appliances, safety devices (such as AFCI, GFCI and smoke alarms) and equipment used in dwellings. Surges can enter through lightning; the utility or surges can be generated from internal utilization equipment. The addition of bullet point #5 is to align with the addition of 210.12D(3).

Reference 210.12D(3):
210.12 Arc-Fault Circuit-Interrupter Protection
210.12(D) - Other Occupancies:
All 120-volt, single-phase, 10-, 15-, and 20-ampere branch circuits supplying outlets or devices installed in the following locations shall be protected by any of the means described in 210.12(A)(1) through (A)(6):
(1) Guest rooms and guest suites of hotels and motels
(2) Areas used exclusively as patient sleeping rooms in nursing homes and limited-care facilities
(3) Areas designed for use exclusively as sleeping quarters in fire stations, police stations, ambulance stations, rescue stations, ranger stations, and similar locations

Submitter Information Verification

Submitter Full Name:	Randy Dollar
Organization:	Siemens Industry
Affiliation:	American Circuit Breaker Manufacturers Association (ACBMA)
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Fri Sep 01 14:53:42 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: FR-9061-NFPA 70-2024

Statement: The revised language brings the terms in alignment with building code and other standards. The first sentence is revised to comply with the NEC Style Manual section 3.5.3.

Proposed item (5) from PI 1306 was not accepted as it does not include providing protection for safety devices in the infrastructure. Proposed item (6) from PI 1306 was not accepted as it is vague and not enforceable.

Item (5) from PI 3367 was accepted to align with the addition of 210.12(D)(3). Surge protection was included in the 2023 NEC to address the recognized need for surge protection to protect the sensitive electronics and systems found in safety devices (such as AFCI, GFCI and smoke alarms).

The Correlating Committee will need to review the use of the term "Dormitories" so it is applied uniformly across the NEC.

CMP-2 is has proposed to revise the definition for "Dormitories."

Public Input No. 4197-NFPA 70-2023 [Section No. 215.18(A)]

(A) Surge-Protective Device.

Where a feeder supplies any of the following, a surge-protective device (SPD) shall be installed:

(1) Dwelling units

(2) Dormitory units

(3) Guest rooms and guest suites of hotels and motels

(4) Areas of nursing homes and limited-care facilities used exclusively as patient sleeping rooms

Exception: Where one-and two-dwelling are protected by surge-protective device (SPD) as required by 230.76, feeder surge-protective device (SPD) shall not be required

Additional Proposed Changes

File Name	Description	Approved
eaton-home-surge-protection-solutions-sa00404006e.pdf	SPD protection	

Statement of Problem and Substantiation for Public Input

Type 1 or Type 2 surge-protective device (SPD) provided at the service as a Type 2 provide a complete surge protection for the home. an additional level of SPD at a downstream subpanel or a load center in one and two family dwelling does not add safety or protection beyond to what service mounted SPD provides.

Submitter Information Verification

Submitter Full Name: Mathher Abbassi
Organization: Abbassi Electric Corp.
Street Address:
City:
State:
Zip:
Submittal Date: Wed Sep 06 20:51:58 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: It is not clear what the exception is attempting to address. The informational note to 215.18(B) specifically indicates that surge protection is most effective when closest to the branch circuit.

Public Input No. 803-NFPA 70-2023 [Section No. 215.18(A)]

(A) Surge-Protective Device.

Where a feeder supplies any of the following, a surge-protective device (SPD) shall be installed:

(1) Dwelling units

(2) ~~Dormitory units~~ Dormitories

(3) Guest rooms and guest suites of hotels, motels, and ~~motels~~ dormitories

(4) Areas of nursing homes and limited-care facilities used exclusively as patient sleeping rooms

Statement of Problem and Substantiation for Public Input

OBJECTIVE:
• USABILITY of NEC® and consistent CORRELATION with the defined term's EXTRACTION source NFPA 101® Life Safety Code® regarding INDIVIDUAL guest rooms and individual guest suites of dormitories versus the ENTIRE dormitory occupancy. NEC® Correlation Committee [NEC-AAC] take note.

.

BACKGROUND: Users of NEC® have encountered interpretational discrepancies with the present confusing wording. Presently, interpretation confusion exists to readers of NEC® regarding the use of the term "dormitory UNIT" versus the ambiguous clause " ... group sleeping accommodations are provided for more than 16 persons who are not members of the same family IN ONE ROOM, OR A SERIES OF CLOSELY ASSOCIATED ROOMS, ...". Because of misinterpretation that the "UNIT" MUST accommodate "more than 16 persons", specific dormitory rooms intended for an individual student or a few individual students have been deemed wrongly to NOT constitute a dormitory UNIT because those individual rooms cannot accommodate "MORE THAN 16 PERSONS".

.

The phrase "IN ONE ROOM, OR A SERIES OF CLOSELY ASSOCIATED ROOMS" refers to "who are NOT MEMBERS of the SAME FAMILY", and does NOT refer to the "group SLEEPING ACCOMMODATIONS" having to be within in ONE room or ONE suite of rooms. Consequently, "dormitory" refers to the ENTIRE building or the ENTIRE space within that building AS AN OCCUPANCY that must accommodate MORE THAN 16 persons, and NOT to EACH specific sleeping room accommodating more than 16 persons.

.

Misuse of the term "dormitory UNIT" has effectively DIMINISHED SAFETY for what are colloquially called "dormitory rooms" that are now wrongly NOT treated as guest rooms or guest suites WITHIN a DORMITORY OCCUPANY. These so-called dormitory UNITS (INDIVIDUAL ROOMS) are being misinterpreted such that intended GFCI, AFCI, SPD and other protection requirements do NOT APPLY for DORMITORY bedrooms, for DORMITORY living rooms, and for closets and hallways INSIDE the so-called dormitory UNIT if that "UNIT" accommodates FEWER THAN 17 OCCUPANTS.

.

NFPA 101® Informational Annex A has long ago addressed this misinterpretation: "A.3.3.68 Dormitory. Rooms within dormitories intended for the use of individuals for combined living and sleeping purposes are guest rooms or guest suites. Examples of dormitories are college dormitories, fraternity and sorority houses, and military barracks.". Further, "Guest Room" and "Guest Suite" are ALREADY explicitly defined terms in both NFPA 70® and NFPA 101 [3.3.136 for "Guest Room"; 3.3.285.1 for "Guest Suite"].

.

It is essential therefore that the terminology and usage for dormitories and for guest rooms and guest suites of dormitories in NFPA 70® be clarified at this time, CONSISTENT with NFPA 101®, to avoid enforcement confusion between Codes.

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Related Public Inputs address the corresponding changes elsewhere in NFPA 70 that must be revised accordingly.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 587-NFPA 70-2023 [Definition: Busbar.]	Clarification of NEC ambiguity in the definition extracted from NFPA 101
Public Input No. 798-NFPA 70-2023 [Definition: Dormitory Unit.]	

Submitter Information Verification

Submitter Full Name: Brian Rock
Organization: Hubbell Incorporated
Street Address:
City:
State:
Zip:
Submittal Date: Fri May 12 17:29:22 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9061-NFPA 70-2024

Statement: The revised language brings the terms in alignment with building code and other standards. The first sentence is revised to comply with the NEC Style Manual section 3.5.3.

Proposed item (5) from PI 1306 was not accepted as it does not include providing protection for safety devices in the infrastructure. Proposed item (6) from PI 1306 was not accepted as it is vague and not enforceable.

Item (5) from PI 3367 was accepted to align with the addition of 210.12(D)(3). Surge protection was included in the 2023 NEC to address the recognized need for surge protection to protect the sensitive electronics and systems found in safety devices (such as AFCI, GFCI and smoke alarms).

The Correlating Committee will need to review the use of the term "Dormitories" so it is applied uniformly across the NEC.

CMP-2 is has proposed to revise the definition for "Dormitories."

Public Input No. 4329-NFPA 70-2023 [New Article after 220]

Article 220 Feeders Not Over 1000 Volts AC, 1500 Volts DC, Nominal

220.1 Scope.

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

Informational Note: See Part III of Article 225 for feeders over 1000 volts ac or 1500 volts dc.

220.2 Minimum Rating and Size.

(A) General.

Feeder conductors shall have an ampacity not less than the larger of 220.2 (A)(1) or (A)(2) 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 Informative Annex D for Examples D1 through D11.

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, Informational Note 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 220.2(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.

220.3 Overcurrent Protection.

Feeders shall be protected against overcurrent in accordance with Part I of Article 240 . Where a feeder supplies continuous loads or any combination of continuous and noncontinuous loads, the rating of the overcurrent device shall not be less than the noncontinuous load plus 125 percent of the continuous load.

Exception: Where the assembly, including the overcurrent devices protecting the feeder(s), is listed for operation at 100 percent of its rating, the ampere rating of the overcurrent device shall be permitted to be not less than the sum of the continuous load plus the noncontinuous load.

220.4 Feeders with Common Neutral Conductor.

(A) Feeders with Common Neutral.

Up to three sets of 3-wire feeders or two sets of 4-wire or 5-wire feeders shall be permitted to utilize a common neutral.

(B) In Metal Raceway or Enclosure.

Where installed in a metal raceway or other metal enclosure, all conductors of all feeders using a common neutral conductor shall be enclosed within the same raceway or other enclosure as required in 300.20 .

220.5 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.

220.6 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.

220.7 Ungrounded Conductors Tapped from Grounded Systems.

Two-wire dc circuits and ac circuits of two or more ungrounded conductors shall be permitted to be tapped from the ungrounded conductors of circuits having a grounded neutral conductor. Switching devices in each tapped circuit shall have a pole in each ungrounded conductor.

220.9 Ground-Fault Circuit-Interrupter Protection for Personnel.

Feeders shall be permitted to be protected by a listed ground-fault circuit interrupter installed in a readily accessible location in lieu of the provisions for such interrupters as specified in 210.8 and 590.6(A) .

220.10 Ground-Fault Protection of Equipment.

Each feeder disconnect rated 1000 amperes or more and installed on solidly grounded wye electrical systems of more than 150 volts to ground, but not exceeding 1000 volts phase-to-phase, shall be provided with ground-fault protection of equipment in accordance with 230.95 .

Informational Note: See 517.17 for buildings that contain health care occupancies.

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

Exception No. 2: This section shall not apply if ground-fault protection of equipment is provided on the supply side of the feeder and on the load side of any transformer supplying the feeder.

Exception No. 3: If temporary feeder conductors are used to connect a generator to a facility for repair, maintenance, or emergencies, ground-fault protection of equipment shall not be required. Temporary feeders without ground-fault protection shall be permitted for the time period necessary but shall not exceed 90 days.

220.11 Circuits Derived from Autotransformers.

Feeders shall not be derived from autotransformers unless the system supplied has a grounded conductor that is electrically connected to a grounded conductor of the system supplying the autotransformer.

Exception No. 1: An autotransformer shall be permitted without the connection to a grounded conductor where transforming from a nominal 208 volts to a nominal 240-volt supply or similarly from 240 volts to 208 volts.

Exception No. 2: In industrial occupancies, where conditions of maintenance and supervision ensure that only qualified persons service the installation, autotransformers shall be permitted to supply nominal 600-volt loads from nominal 480-volt systems, and 480-volt loads from nominal 600-volt systems, without the connection to a similar grounded conductor.

220.12 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 220.12(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 220.12(C)(1)(a) and (C)(1)(b).

(1) *Means of Identification.* **The means of identification shall be permitted to be by separate color coding, marking tape, tagging, or other approved means.**
(2) *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 60 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 220.12(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.

(1) ***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:**

(2)

i. **A continuous red outer finish**

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

iii. **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)**

iv. **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**

(3) ***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:**

(4) **A continuous black outer finish**

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

(6) **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)**

(7) **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**

220.15 Barriers.

Barriers shall be placed such that no energized, 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) when the disconnecting device, to which the tap conductors are terminated, is in the open position.

220.18 Surge Protection.

(A) Surge-Protective Device.

Where a feeder supplies any of the following, a surge-protective device (SPD) shall be installed:

(1) **Dwelling units**

(2) **Dormitory units**

(3) **Guest rooms and guest suites of hotels and motels**

(4) **Areas of nursing homes and limited-care facilities used exclusively as patient sleeping rooms**

(B) Location.

The SPD shall be installed in or adjacent to distribution equipment, connected to the load side of the feeder, that contains branch circuit overcurrent protective device(s) that supply the locations specified in 220.18(A).

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.

(C) Type.

The SPD shall be a Type 1 or Type 2 SPD.

(D) Replacement.

Where the distribution equipment supplied by the feeder is replaced, all of the requirements of this section shall apply.

(E) Ratings.

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

Statement of Problem and Substantiation for Public Input

With a new Article 215 for Branch-Circuits Over 1000VAC/1500VDC, the existing requirements found in the 2023 edition Article 215 will need to be relocated to Article new Article 220 No technical content has changed. See companion PIs: for submitted proposing the following reorganization:

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 1604-NFPA 70-2023 [New Article after 210]	
Public Input No. 4294-NFPA 70-2023 [Article 220]	
Public Input No. 4334-NFPA 70-2023 [Article 225]	
Public Input No. 1611-NFPA 70-2023 [New Article after 225]	
Public Input No. 1613-NFPA 70-2023 [Article 235]	
Public Input No. 4311-NFPA 70-2023 [New Section after 110.79]	
Public Input No. 1604-NFPA 70-2023 [New Article after 210]	
Public Input No. 1611-NFPA 70-2023 [New Article after 225]	
Public Input No. 1613-NFPA 70-2023 [Article 235]	
Public Input No. 4294-NFPA 70-2023 [Article 220]	
Public Input No. 4311-NFPA 70-2023 [New Section after 110.79]	
Public Input No. 4334-NFPA 70-2023 [Article 225]	

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Submittal Date:	Thu Sep 07 11:51:00 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: New article numbering is under the purview of the CC. There were no technical changes made, so the title should remain.

Public Input No. 140-NFPA 70-2023 [Article 225]

Article 225 Outside Branch Circuits and Feeders

Part I. General

225.1 Scope.

This article covers requirements for outside branch circuits and feeders not over 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 Part IV of Article 235 for outside branch circuits and feeders over 1000 volts ac or 1500 volts dc.

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 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	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

225.4 Conductor Insulation.

Where within 3.0 m (10 ft) of any building or structure other than supporting poles or towers, open individual (aerial) overhead conductors shall be insulated for the nominal voltage. The insulation of conductors in cables or raceways, except Type MI cable, shall be of thermoset or thermoplastic type and, in wet locations, shall comply with 310.10(C). The insulation of conductors for festoon lighting shall be of the thermoset or thermoplastic type.

Exception: Equipment grounding conductors and grounded circuit conductors shall be permitted to be bare or covered as specifically permitted elsewhere in this Code.

225.6 Conductor Size and Support.

(A) Overhead Spans.

Open individual conductors shall not be smaller than 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.

(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~~ 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

225.11 Feeder and Branch-Circuit Conductors Entering, Exiting, or Attached to Buildings or Structures.

Feeder and branch-circuit conductors entering or exiting buildings or structures shall be installed in accordance with 230.52. Overhead branch circuits and feeders attached to buildings or structures shall be installed in accordance with 230.54.

225.12 Open-Conductor Supports.

Open conductors shall be supported on knobs, racks, brackets, or strain insulators, that are made of glass, porcelain, or other approved materials.

225.14 Open-Conductor Spacings.

Conductors shall comply with the spacings provided in Table 230.51(C).

(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:

  (3) 300 volts or less — 600 mm (24 in.)

  (4) Over 300 volts — 750 mm (30 in.)

(5) Communications conductors below power conductors — same as power conductors

(6) Communications conductors alone — no requirement

225.15 Supports over Buildings ~~.~~ or Other Structures

Outside branch-circuit and feeder conductors passing over a building ~~shall~~ or other structure shall be securely supported.

225.16 Attachment to Buildings ~~.~~ or Other Structures

(A) Point of Attachment.

The point of attachment to a building ~~shall~~ or other structure shall be in accordance with 230.26.

(B) Means of Attachment.

The means of attachment to a building ~~shall~~ or other structure shall be in accordance with 230.27.

225.17 Masts as Supports.

Only feeder or branch-circuit conductors specified within this section shall be permitted to be attached to the feeder and/or branch-circuit mast. Masts used for the support of final spans of feeders or branch circuits shall be installed in accordance with 225.17(A) and (B).

(A) Strength.

The mast shall have adequate strength or be supported by braces or guy wires to safely withstand the strain imposed by the overhead feeder or branch-circuit conductors. Hubs intended for use with a conduit serving as a mast for support of feeder or branch-circuit conductors shall be identified for use with a mast.

(B) Attachment.

Feeder and/or branch-circuit conductors shall not be attached to a mast where the connection is between a weatherhead or the end of the conduit and a coupling where the coupling is located above the last point of securement to the building or other structure, or where the coupling is located above the building or other structure.

225.18 Clearance for Overhead Conductors and Cables.

Overhead spans of open conductors and open multiconductor cables of not over 1000 volts, nominal, shall have a clearance of not less than the following:

(1) 3.0 m (10 ft) — above finished grade, sidewalks, or from any platform or projection that will permit personal contact where the voltage does not exceed 150 volts to ground and accessible to pedestrians only

(2) 3.7 m (12 ft) — over residential property and driveways, and those commercial areas not subject to truck traffic where the voltage does not exceed 300 volts to ground

(3) 4.5 m (15 ft) — for those areas listed in the 3.7 m (12 ft) classification where the voltage exceeds 300 volts to ground

(4) 5.5 m (18 ft) — over public streets, alleys, roads, parking areas subject to truck traffic, driveways on other than residential property, and other land traversed by vehicles, such as cultivated, grazing, forest, and orchard

(5) 7.5 m (24½ ft) — over track rails of railroads

225.19 Clearances from Buildings ~~for~~ or Other Structures for Conductors of Not over 1000 Volts, Nominal.

Overhead spans of open conductors and open multiconductor cables shall comply with 225.19(A), (B), (C), and (D).

(A) Above Roofs.

Overhead spans of open conductors and open multiconductor cables shall have a vertical clearance of not less than 2.6 m (8 ft 6 in.) above the roof surface. The vertical clearance above the roof level shall be maintained for a distance not less than 900 mm (3 ft) in all directions from the edge of the roof.

Exception No. 1: The area above a roof surface subject to pedestrian or vehicular traffic shall have a vertical clearance from the roof surface in accordance with the clearance requirements of 225.18.

Exception No. 2: Where the voltage between conductors does not exceed 300, and the roof has a slope of 100 mm in 300 mm (4 in. in 12 in.) or greater, a reduction in clearance to 900 mm (3 ft) shall be permitted.

Exception No. 3: Where the voltage between conductors does not exceed 300, a reduction in clearance above only the overhanging portion of the roof to not less than 450 mm (18 in.) shall be permitted if (1) not more than 1.8 m (6 ft) of the conductors, 1.2 m (4 ft) horizontally, pass above the roof overhang, and (2) they are terminated at a through-the-roof raceway or approved support.

Exception No. 4: The requirement for maintaining the vertical clearance 900 mm (3 ft) from the edge of the roof shall not apply to the final conductor span where the conductors are attached to the side of a building.

(B) From Nonbuilding or Nonbridge Structures.

From signs, chimneys, radio and television antennas, tanks, and other nonbuilding or nonbridge structures, clearances — vertical, diagonal, and horizontal — shall not be less than 900 mm (3 ft).

(C) Horizontal Clearances.

Clearances shall not be less than 900 mm (3 ft).

(D) Final Spans.

Final spans of feeders or branch circuits shall comply with 225.19(D)(1), (D)(2), and (D)(3).

(1) Clearance from Windows.

Final spans to the building they supply, or from which they are fed, shall be permitted to be attached to the building, but they shall be kept not less than 900 mm (3 ft) from windows that are designed to be opened, and from doors, porches, balconies, ladders, stairs, fire escapes, or similar locations.

Exception: Conductors run above the top level of a window shall be permitted to be less than the 900 mm (3 ft) requirement.

(2) Vertical Clearance.

The vertical clearance of final spans above or within 900 mm (3 ft) measured horizontally of platforms, projections, or surfaces that will permit personal contact shall be maintained in accordance with 225.18.

(3) Building Openings.

The overhead branch-circuit and feeder conductors shall not be installed beneath openings through which materials may be moved, such as openings in farm and commercial buildings, and shall not be installed where they obstruct entrance to these openings.

(E) Zone for Fire Ladders.

Where buildings exceed three stories or 15 m (50 ft) in height, overhead lines shall be arranged, where practicable, so that a clear space (or zone) at least 1.8 m (6 ft) wide will be left either adjacent to the buildings or beginning not over 2.5 m (8 ft) from them to facilitate the raising of ladders when necessary for fire fighting.

225.20 Protection Against Physical Damage.

Conductors installed on buildings, structures, or poles shall be protected against physical damage as provided for services in 230.50.

225.21 Multiconductor Cables on Exterior Surfaces of Buildings ~~(~~ or Other Structures~~)~~ .

Supports for multiconductor cables on exterior surfaces of buildings ~~(~~ or other ~~structures) shall~~ structures shall be as provided in 230.51.

225.22 Raceways on Exterior Surfaces of Buildings or Other Structures.

Raceways on exteriors of buildings or other structures shall be arranged to drain and shall be listed or approved for use in wet locations.

225.24 Outdoor Lampholders.

Where outdoor lampholders are attached as pendants, the connections to the circuit wires shall be staggered. Where such lampholders have terminals of a type that puncture the insulation and make contact with the conductors, they shall be attached only to conductors of the stranded type.

225.25 Location of Outdoor Lamps.

Locations of lamps for outdoor lighting shall be below all energized conductors, transformers, or other electric utilization equipment, unless either of the following apply:

(1) Clearances or other safeguards are provided for relamping operations.

(2) Equipment is controlled by a disconnecting means that is lockable open in accordance with 110.25.

225.26 Vegetation as Support.

Vegetation such as trees shall not be used for support of overhead conductor spans.

225.27 Raceway Seal.

Where a raceway enters a building or structure from outside, it shall be sealed in accordance with 300.5(G) and 300.7(A). Spare or unused raceways shall also be sealed. Sealants shall be identified for use with cable insulation, conductor insulation, bare conductor, shield, or other components.

Part II. Buildings or Other Structures Supplied by a Feeder(s) or Branch Circuit(s)

225.30 Number of Supplies.

A building or other structure that is served by a branch circuit or feeder on the load side of a service disconnecting means shall be supplied by only one feeder or branch circuit unless permitted in 225.30(A) through (F). For the purpose of this section, a multiwire branch circuit shall be considered a single circuit.

Where a branch circuit or feeder originates in these additional buildings or other structures, only one feeder or branch circuit shall be permitted to supply power back to the original building or structure, unless permitted in 225.30(A) through (F).

(A) Special Conditions.

Additional feeders or branch circuits shall be permitted to supply the following:

(1) Fire pumps

(2) Emergency systems

(3) Legally required standby systems

(4) Optional standby systems

(5) Parallel power production systems

(6) Systems designed for connection to multiple sources of supply for the purpose of enhanced reliability

(7) Electric vehicle power transfer systems listed, labeled, and identified for more than a single branch circuit or feeder

(8) Docking facilities and piers

(B) Common Supply Equipment.

Where feeder conductors originate in the same panelboard, switchboard, or other distribution equipment, and each feeder terminates in a single disconnecting means, not more than six feeders shall be permitted. Where more than one feeder is installed in accordance with this section, all feeder disconnects supplying the building or structure shall be grouped in the same location, and the requirements of 225.33 shall not apply. Each disconnect shall be marked to indicate the load served.

(C) Special Occupancies.

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

(1) Multiple-occupancy buildings where there is no space available for supply equipment accessible to all occupants

(2) A single building or other structure sufficiently large to make two or more supplies necessary

(D) Capacity Requirements.

Additional feeders or branch circuits shall be permitted where the capacity requirements are in excess of 2000 amperes at a supply voltage of 1000 volts or less.

(E) Different Characteristics.

Additional feeders or branch circuits shall be permitted for different voltages, frequencies, or phases, or for different uses such as control of outside lighting from multiple locations.

(F) Documented Switching Procedures.

Additional feeders or branch circuits shall be permitted to supply installations under single management where documented safe switching procedures are established and maintained.

225.31 Disconnecting Means.

(A) General.

Means shall be provided for disconnecting all ungrounded conductors that supply or pass through the building or structure.

(B) Location.

The disconnecting means shall be installed either inside or outside of the building or structure served or where the conductors pass through the building or structure. The disconnecting means shall be at a readily accessible location nearest the point of entrance of the conductors. For the purposes of this section, the requirements in 230.6 shall apply.

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

Exception No. 2: For buildings or other structures qualifying under 685.1, the disconnecting means shall be permitted to be located elsewhere on the premises.

Exception No. 3: For towers or poles used as lighting standards, the disconnecting means shall be permitted to be located elsewhere on the premises.

Exception No. 4: For poles or similar structures used only for support of signs installed in accordance with 600.1, the disconnecting means shall be permitted to be located elsewhere on the premises.

225.33 Maximum Number of Disconnects.

(A) General.

The disconnecting means for each supply permitted by 225.30 shall consist of not more than six switches or six circuit breakers mounted in a single enclosure, in a group of separate enclosures, or in or on a switchboard or switchgear. There shall be no more than six disconnects per supply grouped in any one location.

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

(B) Single-Pole Units.

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

225.34 Grouping of Disconnects.

(A) General.

The two to six disconnects as permitted in 225.33 shall be grouped. Each disconnect shall be marked to indicate the load served.

Exception: One of the two to six disconnecting means permitted in 225.33, where used only for a water pump also intended to provide fire protection, shall be permitted to be located remote from the other disconnecting means.

(B) Additional Disconnecting Means.

The one or more additional disconnecting means for fire pumps or for emergency, legally required standby or optional standby system permitted by 225.30 shall be installed sufficiently remote from the one to six disconnecting means for normal supply to minimize the possibility of simultaneous interruption of supply.

225.35 Access to Occupants.

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

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

225.36 Type of Disconnecting Means.

The disconnecting means specified in 225.31 shall be a circuit breaker, molded case switch, general-use switch, snap switch, or other approved means. Where applied in accordance with 250.32(B)(1), Exception No. 1, the disconnecting means shall be suitable for use as service equipment.

225.37 Identification.

Where a building or structure has any combination of feeders, branch circuits, or services passing through it or supplying it, a permanent plaque or directory shall be installed at each feeder and branch-circuit disconnect location denoting 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.

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

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

225.38 Disconnect Construction.

Disconnecting means shall meet the requirements of 225.38(A) through (D).

(A) Manually or Power Operable.

The disconnecting means shall consist of either (1) a manually operable switch or a circuit breaker equipped with a handle or other suitable operating means or (2) a power-operable switch or circuit breaker, provided the switch or circuit breaker can be opened by hand in the event of a power failure.

(B) Simultaneous Opening of Poles.

Each building or structure disconnecting means shall simultaneously disconnect all ungrounded supply conductors that it controls from the building or structure wiring system.

(C) Disconnection of Grounded Conductor.

Where the building or structure disconnecting means does not disconnect the grounded conductor from the grounded conductors in the building or structure wiring, other means shall be provided for this purpose at the location of the disconnecting means. A terminal or bus to which all grounded conductors can be attached by means of pressure connectors shall be permitted for this purpose.

In a multisection switchboard or switchgear, disconnects for the grounded conductor shall be permitted to be in any section of the switchboard or switchgear, if the switchboard section or switchgear section is marked to indicate a grounded conductor disconnect is contained within the equipment.

(D) Indicating.

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

225.39 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. Where the branch circuit or feeder disconnecting means consists of more than one switch or circuit breaker, as permitted by 225.33, combining the ratings of all the switches or circuit breakers for determining the rating of the disconnecting means shall be permitted. In no case shall the rating be lower than specified in 225.39(A), (B), (C), or (D).

(A) One-Circuit Installation.

For installations to supply only limited loads of a single branch circuit, the branch circuit disconnecting means shall have a rating of not less than 15 amperes.

(B) Two-Circuit Installations.

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

(C) One-Family Dwelling.

For a one-family dwelling, the feeder disconnecting means shall have a rating of not less than 100 amperes, 3-wire.

(D) All Others.

For all other installations, the feeder or branch-circuit disconnecting means shall have a rating of not less than 60 amperes.

225.40 Access to Overcurrent Protective Devices.

Where a feeder overcurrent device is not readily accessible, branch-circuit overcurrent devices shall be installed on the load side, shall be mounted in a readily accessible location, and shall be of a lower ampere rating than the feeder overcurrent device.

225.41 Emergency Disconnects.

For one-and two-family dwelling units, an emergency disconnecting means shall be installed.

(A) General.

(1) Location.

The disconnecting means shall be installed in a readily accessible outdoor location on or within sight of the dwelling unit.

(2) Rating.

The disconnecting means shall have a short-circuit current rating equal to or greater than the available fault current.

(3) Grouping.

If more than one disconnecting means is provided, they shall be grouped.

(B) Identification of Other Isolation Disconnects.

Where 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 equipment for isolation of other energy sources shall be located adjacent to the disconnecting means required by this section.

> Informational Note: See 445.18, 480.7, 705.20, and 706.15 for examples of other energy source system isolation means.

(C) Marking.

The disconnecting means shall be marked as EMERGENCY DISCONNECT.

Markings shall comply with 110.21(B) and all 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 least 13 mm (½ in.) high.

225.42 Surge Protection.

(A) Surge-Protective Device.

Where a feeder supplies any of the following, a surge-protective device (SPD) shall be installed:

(1) Dwelling units

(2) Dormitory units

(3) Guest rooms and guest suites of hotels and motels

(4) Areas of nursing homes and limited-care facilities used exclusively as patient sleeping rooms

(B) Location.

The SPD shall be installed in or adjacent to the distribution equipment 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).

> 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.

(C) Type.

The SPD shall be a Type 1 or Type 2 SPD.

(D) Replacement.

Where the distribution equipment supplied by the feeder is replaced, all of the requirements of this section shall apply.

(E) Ratings.

SPDs shall have a nominal discharge current rating (I_n) 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.

Statement of Problem and Substantiation for Public Input

Adding the words “or Other Structures” will help provide better consistency throughout this Article.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 141-NFPA 70-2023 [Article 230]	

Submitter Information Verification

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Submittal Date: Thu Jan 12 06:52:12 EST 2023
Committee: NEC-P10

Committee Statement

Resolution: The submitter has not provided technical substantiation for adding the term “or other structures” wherever the word “building” is shown throughout Article 225.

Public Input No. 3246-NFPA 70-2023 [Article 225]

Article 225 Outside Branch Circuits and Feeders

~~**Part I.** General~~

225.1 Scope.

This article covers requirements for outside branch circuits and feeders not over 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 Part IV of Article 235 for outside branch circuits and feeders over 1000 volts ac or 1500 volts dc.

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 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
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	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

225.

~~4~~

22 Conductor Insulation.

Where within 3.0 m (10 ft) of any building or structure other than supporting poles or towers, open individual (aerial) overhead conductors shall be insulated for the nominal voltage. The insulation of conductors in cables or raceways, except Type MI cable, shall be of thermoset or thermoplastic type and, in wet locations, shall comply with 310.10(C) . The insulation of conductors for festoon lighting shall be of the thermoset or thermoplastic type.

Exception: Equipment grounding conductors and grounded circuit conductors shall be permitted to be bare or covered as specifically permitted elsewhere in this Code.

225.

~~6~~

25 Conductor Size and Support.

(A) Overhead Spans.

Open individual conductors shall not be smaller than 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.

(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~~

43 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

225.

~~11~~

6 Feeder and Branch-Circuit Conductors Entering, Exiting, or Attached to Buildings or Structures.

Feeder and branch-circuit conductors entering or exiting buildings or structures shall be installed in accordance with 230.52 . Overhead branch circuits and feeders attached to buildings or structures shall be installed in accordance with 230.54 .

225.

~~12~~

32 Open-Conductor Supports.

Open conductors shall be supported on knobs, racks, brackets, or strain insulators, that are made of glass, porcelain, or other approved materials.

225.

~~14~~

33 Open-Conductor Spacings.

Conductors shall comply with the spacings provided in Table 230.51(C) .

(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:

    (3) 300 volts or less — 600 mm (24 in.)

    (4) Over 300 volts — 750 mm (30 in.)

(5) Communications conductors below power conductors — same as power conductors

(6) Communications conductors alone — no requirement

225.

~~15~~

29 Supports over Buildings.

Outside branch-circuit and feeder conductors passing over a building shall be securely supported.

225.

~~16 Attachment to Buildings.~~ ~~**(A)**~~

~~**26** Point of Attachment.~~

~~The point of attachment to a building shall be in accordance with 230.26 .~~

~~(B)~~

~~**225.27** Means of Attachment.~~

~~The means of attachment to a building shall be in accordance with 230.27 .~~

~~**225.**~~

~~17~~

~~**28** Masts as Supports.~~

~~Only feeder or branch-circuit conductors specified within this section shall be permitted to be attached to the feeder and/or branch-circuit mast. Masts used for the support of final spans of feeders or branch circuits shall be installed in accordance with 225.~~

~~17~~

~~28 (A) and (B).~~

~~**(A)** Strength.~~

~~The mast shall have adequate strength or be supported by braces or guy wires to safely withstand the strain imposed by the overhead feeder or branch-circuit conductors. Hubs intended for use with a conduit serving as a mast for support of feeder or branch-circuit conductors shall be identified for use with a mast.~~

~~**(B)** Attachment.~~

~~Feeder and/or branch-circuit conductors shall not be attached to a mast where the connection is between a weatherhead or the end of the conduit and a coupling where the coupling is located above the last point of securement to the building or other structure, or where the coupling is located above the building or other structure.~~

~~**225.**~~

~~18~~

~~**24(B)** Clearance for Overhead Conductors and Cables.~~

~~Overhead spans of open conductors and open multiconductor cables of not over 1000 volts, nominal, shall have a clearance of not less than the following:~~

(1) ~~- 3.0 m (10 ft) — above finished grade, sidewalks, or from any platform or projection that will permit personal contact where the voltage does not exceed 150 volts to ground and accessible to pedestrians only~~

(2) ~~- 3.7 m (12 ft) — over residential property and driveways, and those commercial areas not subject to truck traffic where the voltage does not exceed 300 volts to ground~~

(3) ~~- 4.5 m (15 ft) — for those areas listed in the 3.7 m (12 ft) classification where the voltage exceeds 300 volts to ground~~

(4) ~~- 5.5 m (18 ft) — over public streets, alleys, roads, parking areas subject to truck traffic, driveways on other than residential property, and other land traversed by vehicles, such as cultivated, grazing, forest, and orchard~~

(5) ~~- 7.5 m (24 1/2 ft) — over track rails of railroads~~

~~**225.**~~

~~19~~

~~**24** Clearances from Buildings for Conductors of Not over 1000 Volts, Nominal.~~

~~Overhead spans of open conductors and open multiconductor cables shall comply with 225.19(A) , (B), (C), and (D).~~

~~**225.24 (A)** Above Roofs.~~

~~Overhead spans of open conductors and open multiconductor cables shall have a vertical clearance of not less than 2.6 m (8 ft 6 in.) above the roof surface. The vertical clearance above the roof level shall be maintained for a distance not less than 900 mm (3 ft) in all directions from the edge of the roof.~~

~~*Exception No. 1: The area above a roof surface subject to pedestrian or vehicular traffic shall have a vertical clearance from the roof surface in accordance with the clearance requirements of 225.*~~

~~18~~

~~*24(B) .*~~

~~*Exception No. 2: Where the voltage between conductors does not exceed 300, and the roof has a slope of 100 mm in 300 mm (4 in. in 12 in.) or greater, a reduction in clearance to 900 mm (3 ft) shall be permitted.*~~

~~*Exception No. 3: Where the voltage between conductors does not exceed 300, a reduction in clearance above only the overhanging portion of the roof to not less than 450 mm (18 in.) shall be permitted if (1) not more than 1.8 m (6 ft) of the conductors, 1.2 m (4 ft) horizontally, pass above the roof overhang, and (2) they are terminated at a through-the-roof raceway or approved support.*~~

~~*Exception No. 4: The requirement for maintaining the vertical clearance 900 mm (3 ft) from the edge of the roof shall not apply to the final conductor span where the conductors are attached to the side of a building.*~~

~~**225.24 (**~~

~~B~~

~~**D)** From Nonbuilding or Nonbridge Structures.~~

~~From signs, chimneys, radio and television antennas, tanks, and other nonbuilding or nonbridge structures, clearances — vertical, diagonal, and horizontal — shall not be less than 900 mm (3 ft).~~

~~**225.24 (C)** Horizontal Clearances.~~

~~Clearances shall not be less than 900 mm (3 ft).~~

~~(D)~~

~~**225.9** Final Spans.~~

~~Final spans of feeders or branch circuits shall comply with 225.~~

~~19~~

~~9 (D)(1) , (D)(2),~~

~~and~~

~~(D)(3) and (D)((4) .~~

~~**(1)** Clearance from Windows.~~

~~Final spans to the building they supply, or from which they are fed, shall be permitted to be attached to the building, but they shall be kept not less than 900 mm (3 ft) from windows that are designed to be opened, and from doors, porches, balconies, ladders, stairs, fire escapes, or similar locations.~~

~~*Exception: Conductors run above the top level of a window shall be permitted to be less than the 900 mm (3 ft) requirement.*~~

~~**(2)** Vertical Clearance.~~

~~The vertical clearance of final spans above or within 900 mm (3 ft) measured horizontally of platforms, projections, or surfaces that will permit personal contact shall be maintained in accordance with 225.~~

~~18~~

~~24(B) .~~

~~**(3)** Building Openings.~~

~~The overhead branch-circuit and feeder conductors shall not be installed beneath openings through which materials may be moved, such as openings in farm and commercial buildings, and shall not be installed where they obstruct entrance to these openings.~~

~~**(E)** Zone for Fire Ladders.~~

~~Where buildings exceed three stories or 15 m (50 ft) in height, overhead lines shall be arranged, where practicable, so that a clear space (or zone) at least 1.8 m (6 ft) wide will be left either adjacent to the buildings or beginning not over 2.5 m (8 ft) from them to facilitate the raising of ladders when necessary for fire fighting.~~

~~**225.**~~

~~20~~

~~**50** Protection Against Physical Damage.~~

~~Conductors installed on buildings, structures, or poles shall be protected against physical damage as provided for services in 230.50 .~~

~~**225.**~~

~~21~~

~~**35** Multiconductor Cables on Exterior Surfaces of Buildings (or Other Structures).~~

~~Supports for multiconductor cables on exterior surfaces of buildings (or other structures) shall be as provided in 230.51 .~~

~~**225.**~~

~~22~~

~~**38** Raceways on Exterior Surfaces of Buildings or Other Structures.~~

~~Raceways on exteriors of buildings or other structures shall be arranged to drain and shall be listed or approved for use in wet locations.~~

~~**225.**~~

~~24~~

~~**39** Outdoor Lampholders.~~

~~Where outdoor lampholders are attached as pendants, the connections to the circuit wires shall be staggered. Where such lampholders have terminals of a type that puncture the insulation and make contact with the conductors, they shall be attached only to conductors of the stranded type.~~

~~**225.**~~

~~25~~

~~**40** Location of Outdoor Lamps.~~

~~Locations of lamps for outdoor lighting shall be below all energized conductors, transformers, or other electric utilization equipment, unless either of the following apply:~~

(1) ~~Clearances or other safeguards are provided for relamping operations.~~

(2) ~~Equipment is controlled by a disconnecting means that is lockable open in accordance with 110.25 .~~

~~**225.**~~

~~26~~

~~**10** Vegetation as Support.~~

~~Vegetation such as trees shall not be used for support of overhead conductor spans.~~

~~**225.**~~

~~27~~

~~**8** Raceway Seal.~~

~~Where a raceway enters a building or structure from outside, it shall be sealed in accordance with 300.5(G) and 300.7(A) . Spare or unused raceways shall also be sealed. Sealants shall be identified for use with cable insulation, conductor insulation, bare conductor, shield, or other components.~~

~~**Part II.** Buildings or Other Structures Supplied by a Feeder(s) or Branch Circuit(s)~~

225.

~~30~~

4 Number of Supplies.

A building or other structure that is served by a branch circuit or feeder on the load side of a service disconnecting means shall be supplied by only one feeder or branch circuit unless permitted in 225.

~~30~~

4 (A)

~~through~~

through (

~~F~~

E). For the purpose of this section, a multiwire branch circuit shall be considered a single circuit.

Where a branch circuit or feeder originates in these additional buildings or other structures, only one feeder or branch circuit shall be permitted to supply power back to the original building or structure, unless permitted in 225.

~~30~~

4 (A)

~~through~~

through (

~~F~~

E).

225.4 (A) Special Conditions.

Additional feeders or branch circuits shall be permitted to supply the following:

(1) Fire pumps

(2) Emergency systems

(3) Legally required standby systems

(4) Optional standby systems

(5) Parallel power production systems

(6) Systems designed for connection to multiple sources of supply for the purpose of enhanced reliability

(7) Electric vehicle power transfer systems listed, labeled, and identified for more than a single branch circuit or feeder

(8) Docking facilities and piers

225.71 (

~~B~~

C) Common Supply Equipment.

Where feeder conductors originate in the same panelboard, switchboard, or other distribution equipment, and each feeder terminates in a single disconnecting means, not more than six feeders shall be permitted. Where more than one feeder is installed in accordance with this section, all feeder disconnects supplying the building or structure shall be grouped in the same location, and the requirements of 225.33 shall not apply. Each disconnect shall be marked to indicate the load served.

225.4 (

~~C~~

B)

Special Occupancies.

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

(1) Multiple-occupancy buildings where there is no space available for supply equipment accessible to all occupants

(2) A single building or other structure sufficiently large to make two or more supplies necessary

225.4 (

~~D~~

C) Capacity Requirements.

Additional feeders or branch circuits shall be permitted where the capacity requirements are in excess of 2000 amperes at a supply voltage of 1000 volts or less.

225.4 (

~~E~~

D) Different Characteristics.

Additional feeders or branch circuits shall be permitted for different voltages, frequencies, or phases, or for different uses such as control of outside lighting from multiple locations.

225.71 (

~~F~~

D) Documented Switching Procedures.

Additional feeders or branch circuits shall be permitted to supply installations under single management where documented safe switching procedures are established and maintained.

225.

~~31~~

70 Disconnecting Means.

225.70 (A) General.

Means shall be provided for disconnecting all ungrounded conductors that supply or pass through the building or structure.

225.70 (B) Location.

The disconnecting means shall be installed either inside or outside of the building or structure served or where the conductors pass through the building or structure. The disconnecting means shall be at a readily accessible location nearest the point of entrance of the conductors. For the purposes of this section, the requirements in 230.6 shall apply.

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

Exception No. 2: For buildings or other structures qualifying under 685.1 , the disconnecting means shall be permitted to be located elsewhere on the premises.

Exception No. 3: For towers or poles used as lighting standards, the disconnecting means shall be permitted to be located elsewhere on the premises.

Exception No. 4: For poles or similar structures used only for support of signs installed in accordance with 600.1 , the disconnecting means shall be permitted to be located elsewhere on the premises.

225.

~~33~~

71 Maximum Number of Disconnects.

225.71 (A) General.

The disconnecting means for each supply permitted by 225.

~~30 shall~~

4 shall consist of not more than six switches or six circuit breakers mounted in a single enclosure, in a group of separate enclosures, or in or on a switchboard or switchgear. There shall be no more than six disconnects per supply grouped in any one location.

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

225.71 (B) Single-Pole Units.

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

225.

~~34~~

72 Grouping of Disconnects.

225.72 (A) General.

The two to six disconnects as permitted in 225.

~~33 shall~~

71 shall be grouped. Each disconnect shall be marked to indicate the load served.

Exception: One of the two to six disconnecting means permitted in 225.

~~33~~

71 , where used only for a water pump also intended to provide fire protection, shall be permitted to be located remote from the other disconnecting means.

225.72 (B) Additional Disconnecting Means.

The one or more additional disconnecting means for fire pumps or for emergency, legally required standby or optional standby system permitted by 225.

~~30 shall~~

4 shall be installed sufficiently remote from the one to six disconnecting means for normal supply to minimize the possibility of simultaneous interruption of supply.

225.

~~35~~

72(C) Access to Occupants.

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

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

225.

~~36~~

78 Type of Disconnecting Means.

The disconnecting means specified in 225.

~~31 shall~~

70 shall be a circuit breaker, molded case switch, general-use switch, snap switch, or other approved means. Where applied in accordance with 250.32(B)(1) , Exception No. 1, the disconnecting means shall be suitable for use as service equipment.

225.

~~37~~

4(E) Identification.

Where a building or structure has any combination of feeders, branch circuits, or services passing through it or supplying it, a permanent plaque or directory shall be installed at each feeder and branch-circuit disconnect location denoting 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.

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

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

225.

~~38 Disconnect Construction.~~

~~Disconnecting means shall meet the requirements of 225.38(A) through (D).~~

~~(A)~~

76 Manually or Power Operable Disconnecting Means .

The disconnecting means shall consist of either (1) a manually operable switch or a circuit breaker equipped with a handle or other suitable operating means or (2) a power-operable switch or circuit breaker, provided the switch or circuit breaker can be opened by hand in the event of a power failure.

~~(B)~~

225.74 Simultaneous Opening of Poles.

Each building or structure disconnecting means shall simultaneously disconnect all ungrounded supply conductors that it controls from the building or structure wiring system.

~~(C)~~

225.75 Disconnection of Grounded Conductor.

Where the building or structure disconnecting means does not disconnect the grounded conductor from the grounded conductors in the building or structure wiring, other means shall be provided for this purpose at the location of the disconnecting means. A terminal or bus to which all grounded conductors can be attached by means of pressure connectors shall be permitted for this purpose.

In a multisection switchboard or switchgear, disconnects for the grounded conductor shall be permitted to be in any section of the switchboard or switchgear, if the switchboard section or switchgear section is marked to indicate a grounded conductor disconnect is contained within the equipment.

~~(D)~~

225.77 Indicating.

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

225.

~~39~~

79 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. Where the branch circuit or feeder disconnecting means consists of more than one switch or circuit breaker, as permitted by 225.

~~33~~

71 , combining the ratings of all the switches or circuit breakers for determining the rating of the disconnecting means shall be permitted. In no case shall the rating be lower than specified in 225.

~~39~~

79 (A) , (B), (C), or (D).

225.79 (A) One-Circuit Installation.

For installations to supply only limited loads of a single branch circuit, the branch circuit disconnecting means shall have a rating of not less than 15 amperes.

225.79 (B) Two-Circuit Installations.

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

225.79 (C) One-Family Dwelling.

For a one-family dwelling, the feeder disconnecting means shall have a rating of not less than 100 amperes, 3-wire.

225.79 (D) All Others.

For all other installations, the feeder or branch-circuit disconnecting means shall have a rating of not less than 60 amperes.

225.

~~40~~

80 Access to Overcurrent Protective Devices.

Where a feeder overcurrent device is not readily accessible, branch-circuit overcurrent devices shall be installed on the load side, shall be mounted in a readily accessible location, and shall be of a lower ampere rating than the feeder overcurrent device.

225.

~~41~~

85 Emergency Disconnects.

For one-and two-family dwelling units, an emergency disconnecting means shall be installed.

225.85 (A) General.

(1) Location.

The disconnecting means shall be installed in a readily accessible outdoor location on or within sight of the dwelling unit.

(2) Rating.

The disconnecting means shall have a short-circuit current rating equal to or greater than the available fault current.

(3) Grouping.

If more than one disconnecting means is provided, they shall be grouped.

225.85 (B) Identification of Other Isolation Disconnects.

Where 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 equipment for isolation of other energy sources shall be located adjacent to the disconnecting means required by this section.

Informational Note: See 445.18 , 480.7 , 705.20 , and 706.15 for examples of other energy source system isolation means.

225.85 (C) Marking.

The disconnecting means shall be marked as EMERGENCY DISCONNECT.

Markings shall comply with 110.21(B) and all 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 least 13 mm (**1**⁄**2** in.) high.

225.

~~42~~

67 Surge Protection.

225.67 (A) Surge-Protective Device.

Where a feeder supplies any of the following, a surge-protective device (SPD) shall be installed:

(1) Dwelling units

(2) Dormitory units

(3) Guest rooms and guest suites of hotels and motels

(4) Areas of nursing homes and limited-care facilities used exclusively as patient sleeping rooms

225.67 (B) Location.

The SPD shall be installed in or adjacent to the distribution equipment 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~~

67 (A) .

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.

225.67 (C) Type.

The SPD shall be a Type 1 or Type 2 SPD.

225.67 (D) Replacement.

Where the distribution equipment supplied by the feeder is replaced, all of the requirements of this section shall apply.

225.67 (E) Ratings.

SPDs shall have a nominal discharge current rating (I_n) 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.

Additional Proposed Changes

File Name	Description	Approved
Article_225_Parallel_Numbering_Public_Input.pdf		

Statement of Problem and Substantiation for Public Input

This Public Input is an attempt to provide parallel numbering between Article 225 and 230. This revision is to comply with NEC Style Manual Section 2.2.1.1. The sections of article were only modified based on the number changes only. The Parts of the Article were deleted since they would no longer apply.
This was a joint effort between Doug Smith and David Williams.

Submitter Information Verification

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Submittal Date: Wed Aug 30 17:20:31 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The NEC Style Manual does not specifically require that parallel numbering be the same in each Article. Removing the Parts in Article 225 does not improve the usability of the Code.

Article 225 Outside Branch Circuits and Feeders

225.1 **225.1 Scope**

This article covers requirements for outside branch circuits and feeders not over 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 Part IV of Article 235 for outside branch circuits and feeders over 1000 volts ac or 1500 volts dc.

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.

225.3-T

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 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
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	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

225.4 **225.4 225.30 Number of Supplies.**

A building or other structure that is served by a branch circuit or feeder on the load side of a service disconnecting means shall be supplied by only one feeder or branch circuit unless permitted in 225.30(A) through (F) **225.4(A) through (E)**. For the purpose of this section, a multiwire branch circuit shall be considered a single circuit.

Where a branch circuit or feeder originates in these additional buildings or other structures, only one feeder or branch circuit shall be permitted to supply power back to the original building or structure, unless permitted in 225.30(A) through (F) **225.4(A) through (E)**.

225.4(A) **225.4(A) Special Conditions.**

Additional feeders or branch circuits shall be permitted to supply the following:

(1) Fire pumps
(2) Emergency systems
(3) Legally required standby systems
(4) Optional standby systems
(5) Parallel power production systems
(6) Systems designed for connection to multiple sources of supply for the purpose of enhanced reliability
(7) Electric vehicle power transfer systems listed, labeled, and identified for more than a single branch circuit or feeder
(8) Docking facilities and piers

225.4(B) **225.4(B) (C) Special Occupancies.**

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

(1) Multiple-occupancy buildings where there is no space available for supply equipment accessible to all occupants
(2) A single building or other structure sufficiently large to make two or more supplies necessary

225.4(C) **225.4(C) (D) Capacity Requirements.**

Additional feeders or branch circuits shall be permitted where the capacity requirements are in excess of 2000 amperes at a supply voltage of 1000 volts or less.

225.4(D) **225.4(D) (E) Different Characteristics.**

Additional feeders or branch circuits shall be permitted for different voltages, frequencies, or phases, or for different uses such as control of outside lighting from multiple locations.

225.4(E) **225.4(E) 225.37 Identification.**

Where a building or structure has any combination of feeders, branch circuits, or services passing through it or supplying it, a permanent plaque or directory shall be installed at each feeder and branch-circuit disconnect location denoting 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.

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

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

225.6 **225.6** 225.11 **Feeder and Branch-Circuit Conductors Entering, Exiting, or Attached to Buildings or Structures.**
Feeder and branch-circuit conductors entering or exiting buildings or structures shall be installed in accordance with 230.52. Overhead branch circuits and feeders attached to buildings or structures shall be installed in accordance with 230.54.

225.8 **225.8** 225.27 **Raceway Seal.**
Where a raceway enters a building or structure from outside, it shall be sealed in accordance with 300.5(G) and 300.7(A). Spare or unused raceways shall also be sealed. Sealants shall be identified for use with cable insulation, conductor insulation, bare conductor, shield, or other components.

225.9 **225.9** (D) **Final Spans.**
Final spans of feeders or branch circuits shall comply with 225.19(D)(1), (D)(2), and (D)(3) **225.9(A) through (D).**

225.9(A) **225.9(A)** (1) **Clearance from Windows.**
Final spans to the building they supply, or from which they are fed, shall be permitted to be attached to the building, but they shall be kept not less than 900 mm (3 ft) from windows that are designed to be opened, and from doors, porches, balconies, ladders, stairs, fire escapes, or similar locations.

Exception: Conductors run above the top level of a window shall be permitted to be less than the 900 mm (3 ft) requirement.

225.9(B) **225.9(B)** (2) **Vertical Clearance.**
The vertical clearance of final spans above or within 900 mm (3 ft) measured horizontally of platforms, projections, or surfaces that will permit personal contact shall be maintained in accordance with **225.24(B)** 225.18.

225.9(C) **225.9(C)** (3) **Building Openings.**
The overhead branch-circuit and feeder conductors shall not be installed beneath openings through which materials may be moved, such as openings in farm and commercial buildings, and shall not be installed where they obstruct entrance to these openings.

225.9(D) **225.9(D)** (E) **Zone for Fire Ladders.**
Where buildings exceed three stories or 15 m (50 ft) in height, overhead lines shall be arranged, where practicable, so that a clear space (or zone) at least 1.8 m (6 ft) wide will be left either adjacent to the buildings or beginning not over 2.5 m (8 ft) from them to facilitate the raising of ladders when necessary for fire fighting.

225.10. **225.10** 225.26 **Vegetation as Support.**
Vegetation such as trees shall not be used for support of overhead conductor spans.

225.22 **225.22 225.4 Conductor Insulation**

Where within 3.0 m (10 ft) of any building or structure other than supporting poles or towers, open individual (aerial) overhead conductors shall be insulated for the nominal voltage. The insulation of conductors in cables or raceways, except Type MI cable, shall be of thermoset or thermoplastic type and, in wet locations, shall comply with 310.10(C). The insulation of conductors for festoon lighting shall be of the thermoset or thermoplastic type.

Exception: Equipment grounding conductors and grounded circuit conductors shall be permitted to be bare or covered as specifically permitted elsewhere in this Code.

225.24 **225.24 225.19 Clearances from Buildings for Conductors of Not over 1000 Volts, Nominal.**

Overhead spans of open conductors and open multiconductor cables shall comply with **225.24** 225.19(A), (B), (C), and (D).

225.24(A) **225.24(A) Above Roofs.**

Overhead spans of open conductors and open multiconductor cables shall have a vertical clearance of not less than 2.6 m (8 ft 6 in.) above the roof surface. The vertical clearance above the roof level shall be maintained for a distance not less than 900 mm (3 ft) in all directions from the edge of the roof.

Exception No. 1: The area above a roof surface subject to pedestrian or vehicular traffic shall have a vertical clearance from the roof surface in accordance with the clearance requirements of **225.24(B)** 225.18.

Exception No. 2: Where the voltage between conductors does not exceed 300, and the roof has a slope of 100 mm in 300 mm (4 in. in 12 in.) or greater, a reduction in clearance to 900 mm (3 ft) shall be permitted.

Exception No. 3: Where the voltage between conductors does not exceed 300, a reduction in clearance above only the overhanging portion of the roof to not less than 450 mm (18 in.) shall be permitted if (1) not more than 1.8 m (6 ft) of the conductors, 1.2 m (4 ft) horizontally, pass above the roof overhang, and (2) they are terminated at a through-the-roof raceway or approved support.

Exception No. 4: The requirement for maintaining the vertical clearance 900 mm (3 ft) from the edge of the roof shall not apply to the final conductor span where the conductors are attached to the side of a building.

225.24(B) **224.24(B) 225.18 Clearance for Overhead Conductors and Cables.**

Overhead spans of open conductors and open multiconductor cables of not over 1000 volts, nominal, shall have a clearance of not less than the following:

(1) 3.0 m (10 ft) — above finished grade, sidewalks, or from any platform or projection that will permit personal contact where the voltage does not exceed 150 volts to ground and accessible to pedestrians only

(2) 3.7 m (12 ft) — over residential property and driveways, and those commercial areas not subject to truck traffic where the voltage does not exceed 300 volts to ground

(3) 4.5 m (15 ft) — for those areas listed in the 3.7 m (12 ft) classification where the voltage exceeds 300 volts to ground

(4) 5.5 m (18 ft) — over public streets, alleys, roads, parking areas subject to truck traffic, driveways on other than residential property, and other land traversed by vehicles, such as cultivated, grazing, forest, and orchard

(5) 7.5 m (241⁄2 ft) — over track rails of railroads

225.24(C) **225.24(C) Horizontal Clearances.**
Clearances shall not be less than 900 mm (3 ft).

225.24(D) **225.24(D) (B) From Nonbuilding or Nonbridge Structures.**
From signs, chimneys, radio and television antennas, tanks, and other nonbuilding or nonbridge structures, clearances — vertical, diagonal, and horizontal — shall not be less than 900 mm (3 ft).

225.25 **225.25 225.6 Conductor Size and Support**

225.25(A) **225.25(A) Overhead Spans**

225.25(A) Open individual conductors shall not be smaller than 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.

225.25(B) **225.25(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.

225.26 **225.26 (A) Point of Attachment.**
The point of attachment to a building shall be in accordance with 230.26.

225.27 **225.27 (B) Means of Attachment.**
The means of attachment to a building shall be in accordance with 230.27.

225.28 **225.28 225.17 Masts as Supports.**
Only feeder or branch-circuit conductors specified within this section shall be permitted to be attached to the feeder and/or branch-circuit mast. Masts used for the support of final spans of feeders or branch circuits shall be installed in accordance with **225.28** 225.17(A) and (B).

225.28(A) **225.28(A) Strength.**
The mast shall have adequate strength or be supported by braces or guy wires to safely withstand the strain imposed by the overhead feeder or branch-circuit conductors. Hubs intended for use with a conduit serving as a mast for support of feeder or branch-circuit conductors shall be identified for use with a mast.

225.28(B) **225.28(B) Attachment.**
Feeder and/or branch-circuit conductors shall not be attached to a mast where the connection is between a weatherhead or the end of the conduit and a coupling where the coupling is located above the last point of securement to the building or other structure, or where the coupling is located above the building or other structure.

225.29 **225.29 225.15 Supports over Buildings.**
Outside branch-circuit and feeder conductors passing over a building shall be securely supported.

225.32 **225.32 225.12 Open-Conductor Supports.**
Open conductors shall be supported on knobs, racks, brackets, or strain insulators, that are made of glass, porcelain, or other approved materials.

225.33 **225.33 225.14 Open-Conductor Spacings.**
Conductors shall comply with the spacings provided in Table 230.51(C).

225.33(A) **225.33(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.).

225.33(B) **225.33(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

225.35 **225.35** ~~225.21~~ **Multiconductor Cables on Exterior Surfaces of Buildings (or Other Structures).**
Supports for multiconductor cables on exterior surfaces of buildings (or other structures) shall be as provided in 230.51.

225.38 **225.38** ~~225.22~~ **Raceways on Exterior Surfaces of Buildings or Other Structures.**
Raceways on exteriors of buildings or other structures shall be arranged to drain and shall be listed or approved for use in wet locations.

225.39 **225.39** ~~225.24~~ **Outdoor Lampholders.**
Where outdoor lampholders are attached as pendants, the connections to the circuit wires shall be staggered. Where such lampholders have terminals of a type that puncture the insulation and make contact with the conductors, they shall be attached only to conductors of the stranded type.

225.40. **225.40** ~~225.25~~ **Location of Outdoor Lamps.**
Locations of lamps for outdoor lighting shall be below all energized conductors, transformers, or other electric utilization equipment, unless either of the following apply:

(1) Clearances or other safeguards are provided for relamping operations.

(2) Equipment is controlled by a disconnecting means that is lockable open in accordance with 110.25.

225.43 **225.43** ~~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:

225.43 (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

225.50. **225.50 225.20 Protection Against Physical Damage.**

Conductors installed on buildings, structures, or poles shall be protected against physical damage as provided for services in 230.50.

225.67 **225.67 225.42 Surge Protection.**

225.67(A) **225.67(A) Surge-Protective Device.**

Where a feeder supplies any of the following, a surge-protective device (SPD) shall be installed:

(1) Dwelling units
(2) Dormitory units
(3) Guest rooms and guest suites of hotels and motels
(4) Areas of nursing homes and limited-care facilities used exclusively as patient sleeping rooms

225.67(B) **225.67(B) Location.**

The SPD shall be installed in or adjacent to the distribution equipment that is connected to the load side of the feeder and contains branch circuit overcurrent protective device(s) that supply the location specified in **225.67** 225.42(A).

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.

225.67(C) **225.67(C) Type.**

The SPD shall be a Type 1 or Type 2 SPD.

225.67(D) **225.67(D) Replacement.**

Where the distribution equipment supplied by the feeder is replaced, all of the requirements of this section shall apply.

225.67(E) **225.67(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.

225.70. **225.70 225.31 Disconnecting Means.**

225.70(A) **225.70(A) General.**

Means shall be provided for disconnecting all ungrounded conductors that supply or pass through the building or structure.

225.70(B) **225.70(B) Location.**

The disconnecting means shall be installed either inside or outside of the building or structure served or where the conductors pass through the building or structure. The disconnecting means shall be at a readily accessible location nearest the point of entrance of the conductors. For the purposes of this section, the requirements in 230.6 shall apply.

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

Exception No. 2: For buildings or other structures qualifying under 685.1, the disconnecting means shall be permitted to be located elsewhere on the premises.

Exception No. 3: For towers or poles used as lighting standards, the disconnecting means shall be permitted to be located elsewhere on the premises.

Exception No. 4: For poles or similar structures used only for support of signs installed in accordance with 600.1, the disconnecting means shall be permitted to be located elsewhere on the premises.

225.71 **225.71 225.33 Maximum Number of Disconnects.**

225.71(A) **225.71(A) General.**

The disconnecting means for each supply permitted by **225.4** 225.30 shall consist of not more than six switches or six circuit breakers mounted in a single enclosure, in a group of separate enclosures, or in or on a switchboard or switchgear. There shall be no more than six disconnects per supply grouped in any one location.

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

225.71(B) **225.71(B) Single-Pole Units.**

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

225.71(C) **225.71(C) (B) Common Supply Equipment.**

Where feeder conductors originate in the same panelboard, switchboard, or other distribution
225.30B equipment, and each feeder terminates in a single disconnecting means, not more than six feeders shall be permitted. Where more than one feeder is installed in accordance with this section, all feeder disconnects supplying the building or structure shall be grouped in the same location, and the requirements of **225.71 (A) and (B)** 225.33 shall not apply. Each disconnect shall be marked to indicate the load served.

225.71(D) **225.71(D) (F) Documented Switching Procedures.**

225.30F Additional feeders or branch circuits shall be permitted to supply installations under single management where documented safe switching procedures are established and maintained.

225.72 **225.72 225.34 Grouping of Disconnects.**

225.72(A) **225.72(A) General.**

The two to six disconnects as permitted in **225.71** 225.33 shall be grouped. Each disconnect shall be marked to indicate the load served.

Exception: One of the two to six disconnecting means permitted in **225.71** 225.33, where used only for a water pump also intended to provide fire protection, shall be permitted to be located remote from the other disconnecting means.

225.72(B) **225.72(B) Additional Disconnecting Means.**

The one or more additional disconnecting means for fire pumps or for emergency, legally required standby or optional standby system permitted by **225.4** 225.30 shall be installed sufficiently remote from the one to six disconnecting means for normal supply to minimize the possibility of simultaneous interruption of supply.

225.72(C) **225.72(C) 225.35 Access to Occupants.**

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

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

225.74 **225.74 (B) Simultaneous Opening of Poles.**

Each building or structure disconnecting means shall simultaneously disconnect all ungrounded supply conductors that it controls from the building or structure wiring system.

225.75 **225.75 (C) Disconnection of Grounded Conductor.**

Where the building or structure disconnecting means does not disconnect the grounded conductor from the grounded conductors in the building or structure wiring, other means shall be provided for this purpose at the location of the disconnecting means. A terminal or bus to which all grounded conductors can be attached by means of pressure connectors shall be permitted for this purpose.

In a multisection switchboard or switchgear, disconnects for the grounded conductor shall be permitted to be in any section of the switchboard or switchgear, if the switchboard section or switchgear section is marked to indicate a grounded conductor disconnect is contained within the equipment.

225.76 **225.76 (A) Manually or Power Operable Disconnecting Means.**

The disconnecting means shall consist of either (1) a manually operable switch or a circuit breaker equipped with a handle or other suitable operating means or (2) a power-operable switch or circuit breaker, provided the switch or circuit breaker can be opened by hand in the event of a power failure.

225.77 **225.76 (D) Indicating.**

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

225.78 **225.78 225.36 Type of Disconnecting Means.**

The disconnecting means specified in **225.70** 225.31 shall be a circuit breaker, molded case switch, general-use switch, snap switch, or other approved means. Where applied in accordance with 250.32(B)(1), Exception No. 1, the disconnecting means shall be suitable for use as service equipment.

225.79 **225.79 225.39 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. Where the branch circuit or feeder disconnecting means consists of more than one switch or circuit breaker, as permitted by **225.71** 225.33, combining the ratings of all the switches or circuit breakers for determining the rating of the disconnecting means shall be permitted. In no case shall the rating be lower than specified in **225.79** 225.39(A), (B), (C), or (D).

225.79(A) **225.79(A) One-Circuit Installation.**

For installations to supply only limited loads of a single branch circuit, the branch circuit disconnecting means shall have a rating of not less than 15 amperes.

225.79(B) **225.79(B) Two-Circuit Installations.**

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

225.79(C) **225.79(C) One-Family Dwelling.**

For a one-family dwelling, the feeder disconnecting means shall have a rating of not less than 100 amperes, 3-wire.

225.79(D **225.79(D) All Others.**

For all other installations, the feeder or branch-circuit disconnecting means shall have a rating of not less than 60 amperes.

225.80. **225.80 225.40 Access to Overcurrent Protective Devices.**

Where a feeder overcurrent device is not readily accessible, branch-circuit overcurrent devices shall be installed on the load side, shall be mounted in a readily accessible location, and shall be of a lower ampere rating than the feeder overcurrent device.

225.85 **225.85 225.41 Emergency Disconnects.**

For one-and two-family dwelling units, an emergency disconnecting means shall be installed.

225.85(A) **225.85(A) General.**

(1) Location.

The disconnecting means shall be installed in a readily accessible outdoor location on or within sight of the dwelling unit.

(2) Rating.

The disconnecting means shall have a short-circuit current rating equal to or greater than the available fault current.

(3) Grouping.

If more than one disconnecting means is provided, they shall be grouped.

225.85(B) **225.85(B) Identification of Other Isolation Disconnects.**

Where 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 equipment for isolation of other energy sources shall be located adjacent to the disconnecting means required by this section.

Informational Note: See 445.18, 480.7, 705.20, and 706.15 for examples of other energy source system isolation means.

225.85(C) **225.85(C) Marking.**

The disconnecting means shall be marked as EMERGENCY DISCONNECT.

Markings shall comply with 110.21(B) and all 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 least 13 mm (1⁄2 in.) high.

Delete **225.16 Attachment to Buildings.**

Delete **Part I General**

Delete **Part II. Buildings or Other Structures Supplied by a Feeder(s) or Branch Circuit(s)**

Delete **225.38 Disconnect Construction.**

Disconnecting means shall meet the requirements of 225.38(A) through (D).

Public Input No. 2631-NFPA 70-2023 [Section No. 225.1]

225.1 Scope.

This article covers requirements for outside branch circuits and feeders not over 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 ~~Part IV of~~ Article 235, Part IV for outside branch circuits and feeders over 1000 volts ac or 1500 volts dc.

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. The text is revised to to comply with the NEC Style Manual Section 4.1.4, regarding the use of Parts.
4.1.4 References to an Entire Article. References shall not be made to an entire article, except for the Article 100 or where referenced to provide the necessary context. References to specific parts within articles shall be permitted. References to all parts of an article shall not be permitted. The article number shall precede the part number.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name: David Williams
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Submittal Date: Wed Aug 23 21:23:01 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9066-NFPA 70-2024
Statement: The text is revised to comply with the NEC Style Manual section 4.1.4, regarding the use of parts.

Public Input No. 4006-NFPA 70-2023 [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 2 and Class 3 remote-control, signaling, and power-limited circuits	725
Class 4 fault managed power circuits	726
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
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	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

Statement of Problem and Substantiation for Public Input

Adding Class 4 to the table for references to other systems and conductors. This should have been done when Class 4 was added in the 2023 code, it's an oversight that it wasn't done.

Submitter Information Verification

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Submittal Date: Wed Sep 06 13:30:40 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: 225.3 is proposed to be deleted to comply with the NEC Style Manual section 4.1.4, so it would not be appropriate to add a new item to the table.

Public Input No. 980-NFPA 70-2023 [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 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 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 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~~

Statement of Problem and Substantiation for Public Input

Section 4.1.4 of the NEC(r) Style Manual prohibits references to an entire article, with the exception of Article 100 or where necessary to provide context. There is a table of contents and an index in this document which can easily lead the user to the other articles found in the code and this table is not necessary as it does not provide a specific section or part of an article that we'd refer the user to. References to 24 different articles in their entirety does not provide any usability improvement and thus I'd recommend deleting this table. Alternatively, if the panel wants to provide specific parts or sections instead, that would also be acceptable but many of these tables were deleted in the last cycle and that should certainly be considered here.

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Committee: NEC-P10

Committee Statement

Resolution: FR-9068-NFPA 70-2024

Statement: 225.3 is deleted to comply with the NEC Style Manual section 4.1.4.

Public Input No. 853-NFPA 70-2023 [Section No. 225.19(C)]

~~(C) Horizontal Clearances.~~

~~Clearances shall not be less than 900 mm (3 ft).~~

Statement of Problem and Substantiation for Public Input

The Code doesn't specify what this is measured to (three feet from what, exactly?). Unlike the rest of this section, Article 230 does not have a similar requirement.

Submitter Information Verification

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Committee: NEC-P10

Committee Statement

Resolution: FR-9070-NFPA 70-2024

Statement: The language is revised to clarify that the clearance is measured horizontally from the building to the conductors.

Public Input No. 511-NFPA 70-2023 [Section No. 225.30]

225.30 Number of ~~Supplies~~ Branch Circuit or Feeder Supplies .

A building or other structure that is served by a branch circuit or feeder on the load side of a service disconnecting means shall be supplied by only one feeder or branch circuit unless permitted in 225.30(A) through (F). For the purpose of this section, a multiwire branch circuit shall be considered a single circuit.

Where a branch circuit or feeder originates in these additional buildings or other structures, only one feeder or branch circuit shall be permitted to supply power back to the original building or structure, unless permitted in 225.30(A) through (F).

(A) Special Conditions.

Additional feeders or branch circuits shall be permitted to supply the following:

(1) Fire pumps

(2) Emergency systems

(3) Legally required standby systems

(4) Optional standby systems

(5) Parallel power production systems

(6) Systems designed for connection to multiple sources of supply for the purpose of enhanced reliability

(7) Electric vehicle power transfer systems listed, labeled, and identified for more than a single branch circuit or feeder

(8) Docking facilities and piers

(B) Common Supply Equipment.

Where feeder conductors originate in the same panelboard, switchboard, or other distribution equipment, and each feeder terminates in a single disconnecting means, not more than six feeders shall be permitted. Where more than one feeder is installed in accordance with this section, all feeder disconnects supplying the building or structure shall be grouped in the same location, and the requirements of 225.33 shall not apply. Each disconnect shall be marked to indicate the load served.

(C) Special Occupancies.

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

(1) Multiple-occupancy buildings where there is no space available for supply equipment accessible to all occupants

(2) A single building or other structure sufficiently large to make two or more supplies necessary

(D) Capacity Requirements.

Additional feeders or branch circuits shall be permitted where the capacity requirements are in excess of 2000 amperes at a supply voltage of 1000 volts or less.

(E) Different Characteristics.

Additional feeders or branch circuits shall be permitted for different voltages, frequencies, or phases, or for different uses such as control of outside lighting from multiple locations.

(F) Documented Switching Procedures.

Additional feeders or branch circuits shall be permitted to supply installations under single management where documented safe switching procedures are established and maintained.

Statement of Problem and Substantiation for Public Input

In keeping with the scope of Article 225, this change clarifies that the supplies covered by 225.30 are only branch circuits and feeders, and that that 225.30 does not regulate services in any way. As the wording currently stands, the subsequent phrase "shall be supplied by only one feeder or branch circuit" can be interpreted to preclude additional supply by a service.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 523-NFPA 70-2023 [Section No. 230.2]	
Public Input No. 524-NFPA 70-2023 [Section No. 225.30 [Excluding any Sub-Sections]]	

Submitter Information Verification

Submitter Full Name:	Wayne Whitney
Organization:	[Not Specified]
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Sat Mar 25 10:40:07 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: The proposed revision does not add clarity because this is already in the article referring to outside branch circuits and feeders.

Public Input No. 3263-NFPA 70-2023 [Section No. 225.30(A)]

(A) Special Conditions.

Additional feeders or branch circuits shall be permitted to supply the following:

(1) Fire pumps

(2) Emergency systems

(3) Legally required standby systems

(4) Optional standby systems

(5) Parallel power production systems

(6) Systems designed for connection to multiple sources of supply for the purpose of enhanced reliability

(7) Electric vehicle power transfer systems listed, labeled, and identified for more than a single branch circuit or feeder

(8) Docking facilities and piers

(9) Stand-Alone Systems

Statement of Problem and Substantiation for Public Input

Adding new list (9) for an additional feeder to be permitted to supply stand-alone systems. Today the production and storage of electrical energy has gotten very creative. There are installations where a PV system is interconnected with an energy storage system to operate as a microgrid in island mode in accordance with Article 710. These stand-alone systems then provide a feeder to specific loads in a building or structure.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 30 20:32:23 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: Stand-alone systems as defined are not supplied from branch circuits or feeders.

Public Input No. 3493-NFPA 70-2023 [Section No. 225.30(A)]

(A) Special Conditions.

Additional feeders or branch circuits shall be permitted to supply the following:

(1) Fire pumps

(2) Emergency systems

(3) Legally required standby systems

(4) Optional standby systems

(5) **Optional standby systems that supply power to more than one non-contiguous commercial or residential building.**

(6) Parallel power production systems

(7) Systems designed for connection to multiple sources of supply for the purpose of enhanced reliability

(8) Electric vehicle power transfer systems listed, labeled, and identified for more than a single branch circuit or feeder

(9) Docking facilities and piers

Statement of Problem and Substantiation for Public Input

The intent is to encourage municipalities to modify local natural gas, electric and telecommunication regulations for new real estate developments so that optional standby power systems can be shared by two or more new non-contiguous residences or two or more non-contiguous new commercial buildings. Building a shared natural gas generator is already a tricky installation to engineer for existing groups of non-contiguous houses or commercial buildings. Legacy installations complicate isolation from the utility source so this proposal contemplates only new installations.

There is enough guidance in NEC “canonicals” – i.e. access, clearances, disconnect, grounding, shock and overcurrent – to encourage innovation among manufacturers to work out the details to make these shared systems possible. Merchant utilities, federal and state power commissions have a limited toolbox for securing reliability during a major regional contingency. The fire safety community – often the front line in any local disaster – has enough tools to start the wave of innovation needed to improve power security.

Submitter Information Verification

Submitter Full Name: Michael Anthony
Organization: Standards Michigan LLC
Affiliation: StandardsMichigan.COM
Street Address:
City:
State:
Zip:
Submittal Date: Mon Sep 04 16:08:38 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The proposed new list item (5) is already allowed by the existing list item (4).

Public Input No. 2065-NFPA 70-2023 [Section No. 225.30(B)]

(B) Common Supply Equipment.

Where feeder conductors originate in the same <u>enclosed</u> panelboard, switchboard, or other distribution equipment, and each feeder terminates in a single disconnecting means, not more than six feeders shall be permitted. Where more than one feeder is installed in accordance with this section, all feeder disconnects supplying the building or structure shall be grouped in the same location, and the requirements of 225.33 shall not apply. Each disconnect shall be marked to indicate the load served.

Statement of Problem and Substantiation for Public Input

The term 'panelboard' and 'enclosed panelboard' are defined terms. Adding the word 'enclosed panelboard' makes the text technically correct. Note: The term 'Enclosed Panelboard' was added to NEC Article 100 during the 2023 Code cycle. This proposed revision will enhance usability throughout the NEC.

Submitter Information Verification

Submitter Full Name: Mike Holt

Organization: Mike Holt Enterprises Inc

Street Address:

City:

State:

Zip:

Submittal Date: Fri Aug 11 14:50:53 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: The requirement applies wherever the feeders originate in a panelboard.

Public Input No. 524-NFPA 70-2023 [Section No. 225.30 [Excluding any Sub-Sections]]

A building or other structure that is ~~served~~ supplied by a service, branch circuit or ~~feeder on the load side of a service disconnecting means shall~~ feeder shall not be supplied by ~~only one feeder or branch circuit~~ another branch circuit or feeder unless permitted in 225.30(A) through (F). See 230.2.

For the purpose of this section, a multiwire branch circuit shall be considered a single circuit.

Where a branch circuit or feeder originates in these additional buildings or other structures, only one feeder or branch circuit shall be permitted to supply power back to the original building or structure, unless permitted in 225.30(A) through (F).

Statement of Problem and Substantiation for Public Input

This change coordinates 225.30 with 230.2.

As the two sections are currently written, the disjoint scopes of Articles 225 and 230 permit a building or other structure to be supplied by both a service and a feeder or branch circuit without restriction. If that is the intention, please disregard this PI.

However, if it is the intention that absent one of the specified conditions, a building or other structure should have only one source of supply, be it service, feeder, or branch circuit, then the proposed wording makes that intention explicit, while still dividing the restriction between Article 225 and 230 in accordance with their scopes.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 523-NFPA 70-2023 [Section No. 230.2]	Coordinating change for services
Public Input No. 511-NFPA 70-2023 [Section No. 225.30]	Opposing PI
Public Input No. 523-NFPA 70-2023 [Section No. 230.2]	

Submitter Information Verification

Submitter Full Name: Wayne Whitney
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Fri Mar 31 13:22:22 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The building is only served by a branch circuit or feeder and not a service. Services are not included in the scope of Article 225.

Public Input No. 3649-NFPA 70-2023 [Section No. 225.31(B)]

(B) Location.

The disconnecting means shall be installed either inside or outside of the building or structure served or where the conductors pass through the building or structure. The disconnecting means shall be at a readily accessible location inside the building or structure nearest the point of entrance of the conductors, outside on the building or structure, or outside at a readibly accessibe location that is within sight from the building or structure . For the purposes of this section, the requirements in 230.6 shall apply.

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

Exception No. 2: For buildings or other structures qualifying under 685.1, the disconnecting means shall be permitted to be located elsewhere on the premises.

Exception No. 3: For towers or poles used as lighting standards, the disconnecting means shall be permitted to be located elsewhere on the premises.

Exception No. 4: For poles or similar structures used only for support of signs installed in accordance with 600.1, the disconnecting means shall be permitted to be located elsewhere on the premises.

Statement of Problem and Substantiation for Public Input

This rule is more restrictive than the rule in 225.41(A)(1) for the one and two family dwelling unit emergency disconnect location. If outside at readily accessible location that is within sight from the building or structure is suitable for the required emergency disconnect, it should also be suitable for the building or structure disconnect for occupancies that do not require an emergency disconnect.

Submitter Information Verification

Submitter Full Name: Don Ganiere

Organization: none

Street Address:

City:

State:

Zip:

Submittal Date: Tue Sep 05 12:10:44 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: The proposed language would locate the disconnect away from the entrance of the conductors to the building. It is important for the disconnect to be located at the point where conductors enter the building. This section is not related to emergency disconnects.

Public Input No. 1003-NFPA 70-2023 [Section No. 225.39 [Excluding any Sub-Sections]]

The ~~feeder or branch-circuit~~ disconnecting means specified in 225.31 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. Where ~~the branch~~ this branch circuit or feeder disconnecting means consists of more than one switch or circuit breaker, as permitted by 225.33, combining the ratings of all the switches or circuit breakers for determining the rating of the disconnecting means shall be permitted. In no case shall the rating be lower than specified in 225.39(A), (B), (C), or (D).

Statement of Problem and Substantiation for Public Input

This change provides greater parallelism with earlier sections such as 225.36, and it avoids the possible misinterpretation that 225.39 is regulating the overcurrent device at the source end of the branch circuit or feeder, rather than the disconnect specified in 225.31.

Submitter Information Verification

Submitter Full Name: Wayne Whitney
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jun 08 23:44:18 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9076-NFPA 70-2024
Statement: The revision clarifies which disconnecting means that this requirement applies to. The text is also revised to comply with the NEC Style Manual section 4.1.4.

Public Input No. 2577-NFPA 70-2023 [Section No. 225.39 [Excluding any Sub-Sections]]

The ~~feeder or branch-circuit~~ disconnecting means specified in 225.31 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. Where the ~~branch circuit or feeder~~ disconnecting means specified in 225.31 consists of more than one switch or circuit breaker, as permitted by 225.33, combining the ratings of all the switches or circuit breakers for determining the rating of the disconnecting means shall be permitted. In no case shall the rating be lower than specified in 225.39(A), (B), (C), or (D).

Statement of Problem and Substantiation for Public Input

A feeder or branch circuit disconnect is by definition located at a the source of a feeder or branch circuit. This proposal is to clarify that 225.39 is referring to the disconnect specified in 225.31.

Submitter Information Verification

Submitter Full Name: Stephen Schmiechen
Organization: Think Electric
Street Address:
City:
State:
Zip:

Submittal Date: Tue Aug 22 15:04:45 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9076-NFPA 70-2024

Statement: The revision clarifies which disconnecting means that this requirement applies to. The text is also revised to comply with the NEC Style Manual section 4.1.4.

Public Input No. 2632-NFPA 70-2023 [Section No. 225.39 [Excluding any Sub-Sections]]

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 Article 220, Parts I and ~~II of Article 220 for~~ II for branch circuits, Article 220, Part III or ~~IV of Article 220 for~~ IV for feeders, or ~~Part V of~~ Article 220 ~~- for~~ , Part V for farm loads. Where the branch circuit or feeder disconnecting means consists of more than one switch or circuit breaker, as permitted by 225.33, combining the ratings of all the switches or circuit breakers for determining the rating of the disconnecting means shall be permitted. In no case shall the rating be lower than specified in 225.39(A), (B), (C), or (D).

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. The text is revised to to comply with the NEC Style Manual Section 4.1.4, regarding the use of Parts.
4.1.4 References to an Entire Article. References shall not be made to an entire article, except for the Article 100 or where referenced to provide the necessary context. References to specific parts within articles shall be permitted. References to all parts of an article shall not be permitted. The article number shall precede the part number.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:

Submittal Date: Wed Aug 23 21:24:03 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9076-NFPA 70-2024
Statement: The revision clarifies which disconnecting means that this requirement applies to. The text is also revised to comply with the NEC Style Manual section 4.1.4.

Public Input No. 536-NFPA 70-2023 [Section No. 225.41]

225.41 Emergency Disconnects.

For one-and two-family dwelling units, an emergency disconnecting means shall be installed.

(A) General.

(1) Location.

The disconnecting means shall be installed in a readily accessible outdoor location on or within sight of the dwelling unit.

(2) Rating.

The equipment within which the disconnecting means is installed shall have a short-circuit current rating equal to or greater than the available fault current.

(3) Grouping.

If more than one disconnecting means is provided, they shall be grouped.

(B) Identification of Other Isolation Disconnects.

Where 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 equipment for isolation of other energy sources shall be located adjacent to the disconnecting means required by this section.

Informational Note: See 445.18, 480.7, 705.20, and 706.15 for examples of other energy source system isolation means.

(C) Marking.

The enclosure for the disconnecting means shall be marked as EMERGENCY DISCONNECT.

Markings shall comply with 110.21(B) and all 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 least 13 mm (½ in.) high.

Statement of Problem and Substantiation for Public Input

This changes in this section seeks to add clarity and accuracy to how the term disconnect is being used. The term “Disconnecting Means” is defined in ARticle 100 as: “A device, or group of devices, or other means by which the conductors of a circuit can be disconnected from their source of supply. (CMP-1)”. A disconnect can be a circuit breaker which does not include the assembly within which it is installed. This public input suggests language changes with the following substantiation:

225.41(A)(2) Rating: The disconnecting means, especially in the case of a circuit breaker, does not have a SCCR. The equipment that contains the disconnecting means has the SCCR. The suggested anguage here seeks to add clarity and accuracy to this section.

225.41(C) Marking: The disconnecting means (i.e. circuit breaker) is not marked but rather the marking or labels must be located on the outside front of the disconnect enclosure as called out in 225.41(C)(1). The suggested language change here seeks to add clarity and accuracy to this section.

Submitter Information Verification

Submitter Full Name: Thomas Domitrovich

Organization: Eaton Corporation

Street Address:

City:

State:

Zip:

Submittal Date: Wed Apr 05 13:41:54 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: FR-9187-NFPA 70-2024

Statement: The proposed change is necessary in order to clarify that the equipment that the disconnect is part of must have a short-circuit current rating (SCCR) not less than the available fault current. In addition, it has been clarified that the enclosure which the disconnect is part of must include the marking “emergency disconnect” and not necessarily the disconnect itself. The proposed exception to 225.41(A)(1) ensures that two disconnecting means are not required when the service or outside feeder or branch circuit disconnecting means are used as the emergency disconnecting means.

Public Input No. 541-NFPA 70-2023 [Section No. 225.41]

225.41 Emergency Disconnects.

For one-and two-family dwelling units and their associated accessory structures , an emergency disconnecting means shall be installed.

(A) General.

(1) Location.

The disconnecting means shall be installed in a readily accessible outdoor location on or within sight of the ~~dwelling unit~~ structure being served .

(2) Rating.

The disconnecting means shall have a short-circuit current rating equal to or greater than the available fault current.

(3) Grouping.

If more than one disconnecting means is provided, they shall be grouped.

(B) Identification of Other Isolation Disconnects.

Where 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 equipment for isolation of other energy sources shall be located adjacent to the disconnecting means required by this section.

Informational Note: See 445.18, 480.7, 705.20, and 706.15 for examples of other energy source system isolation means.

(C) Marking.

The disconnecting means shall be marked as EMERGENCY DISCONNECT.

Markings shall comply with 110.21(B) and all 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 least 13 mm (½ in.) high.

Statement of Problem and Substantiation for Public Input

If the service to a property is located other than at the dwelling unit, (such as if the meter and service disconnect with provisions for several feeders to supply other buildings is located at the property line and feeders are then run to the dwelling unit and to any other accessory structures such as a barn or detached garage) the first responders would have the same need for an identified emergency disconnect that is supplying those accessory structures if they are the structure that is involved in a fire.

Submitter Information Verification

Submitter Full Name: Christine Porter

Organization: Intertek Testing Services

Street Address:

City:

State:

Zip:

Submittal Date: Thu Apr 06 16:13:35 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: The emergency disconnects are required for dwelling units. The proposed terminology is too vague, and substantiation was not provided for expanding emergency disconnects to associated accessory buildings or structures, which are undefined terms.

Public Input No. 542-NFPA 70-2023 [Section No. 225.41]

225.41 Emergency Disconnects.

For one-and two-family dwelling units ~~,~~ and **accessory buildings** an emergency disconnecting means shall be installed.

(A) General.

(1) Location.

The disconnecting means shall be installed in a readily accessible outdoor location on or within sight of the dwelling unit and **accessory buildings** .

(2) Rating.

The disconnecting means shall have a short-circuit current rating equal to or greater than the available fault current.

(3) Grouping.

If more than one disconnecting means is provided, they shall be grouped.

(B) Identification of Other Isolation Disconnects.

Where 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 equipment for isolation of other energy sources shall be located adjacent to the disconnecting means required by this section.

Informational Note: See 445.18, 480.7, 705.20, and 706.15 for examples of other energy source system isolation means.

(C) Marking.

The disconnecting means shall be marked as EMERGENCY DISCONNECT.

Markings shall comply with 110.21(B) and all 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 least 13 mm (½ in.) high.

Statement of Problem and Substantiation for Public Input

This requirement for emergency disconnects on the dwelling unit if supplied with either a service or feeder shall be installed for first responders, the same concerns should be for other outbuildings located at the same dwelling unit property. Adding language for any detached garages, sheds, barns or other accessory buildings that have electric power should have the same emergency disconnect for the same reason and issues that are needed at the dwelling unit.

Submitter Information Verification

Submitter Full Name: Darryl Hill
Organization: Wichita Electrical JATC/IBEW 2
Street Address:
City:
State:
Zip:
Submittal Date: Fri Apr 07 16:12:01 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The emergency disconnects are required for dwelling units. The proposed terminology is too vague, and substantiation was not provided for expanding emergency disconnects to associated accessory buildings or structures, which are undefined terms.

Public Input No. 2024-NFPA 70-2023 [Section No. 225.41(A)(1)]

(1) Location.

The disconnecting means shall be installed in a readily accessible outdoor location on ~~or within sight of~~ the exterior of the dwelling unit.

Statement of Problem and Substantiation for Public Input

This public input is being submitted on behalf of the Minnesota Department of Labor and Industry. Currently, the Department's inspection staff includes 14-office/field staff, 12-state field inspectors, 2-virtual inspectors and 50 plus contract electrical inspectors that complete over 170,000 electrical inspections annually.

This proposed change would require that outside feeder disconnect be located on the exterior of a dwelling unit to be consistent with the proposed changes in 230.70 for a service disconnect.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2021-NFPA 70-2023 [Section No. 230.70(A)]	Exterior service disconnect proposed language.

Submitter Information Verification

Submitter Full Name: Dean Hunter
Organization: Minnesota Department of Labor
Street Address:
City:
State:
Zip:

Submittal Date: Fri Aug 11 09:27:06 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The requirement for the emergency disconnect to be located on the building would require redundant switches when the service disconnect is located on the property on a pole and within sight of the building.

Public Input No. 4122-NFPA 70-2023 [New Section after 225.42]

Part III Stand-Alone Systems

225.80 General. Part III contains requirements for electric power production systems that supply a stand-alone system.

Informational Note: Stand-alone systems often include a single or a compatible interconnection of sources such as engine generators, solar PV, wind, ESS, or batteries.

225.85 Equipment Approval. All power production equipment or systems shall be approved for the intended use and comply with one of the following:

(1) Be listed

(2) Be evaluated for the application and have a field label applied

225.90 Identification of Power Sources. A permanent plaque, label, or directory shall be installed at each power source disconnecting means location, or at an approved readily visible location. The plaque, label, or directory shall denote the location of each power source disconnecting means for the building. Where multiple sources supply the building, marking shall comply with 705.10.

225.95 Wiring and Supply Capacity. Premises wiring systems shall be adequate to meet the requirements of this Code for similar installations supplied by a feeder or service. The wiring on the supply side of the building or structure disconnecting means shall comply with the requirements of this Code, except as modified by 225.95 (A) through (E).

(A) Supply Output. Power supply to premises wiring systems shall have a capacity rating based on the largest load intended to be operated at one time. Equipment marking and documentation shall be provided as follows:

(1) The supply capacity shall be marked on the equipment containing the system branch circuit overcurrent protective device(s).

(2) Documentation of the load calaculation shall be made available to those authorized to inspect, operate, and maintain the system.

(B) Sizing and Protection. The circuit conductors between a stand-alone source and a building or structure disconnecting means shall be sized based on the sum of the output ratings of the stand-alone source(s). For three-phase interconnections, the phase loads shall be controlled or balanced to be compatible with the specifications of the sum of the power supply capacities.

(C) Since 120-Volt Supply. Stand-alone systems shall be permitted to supply 120 volts to single-phase, 3-wire, 120/240-volt service equipment or distribution panels where there are no 240-volt outlets and where there are no multiwire branch circuits. In all installations, the sum of the ratings of the power sources shall be less than the rating of the neutral bus in the service equipment or distribution panel. This equipment shall be marked with the following words or equivalent:

Warning: Single 120-VOLT SUPPLY. DO NOT CONNECT MULTIWIRE BRANCH CIRCUITS!

The warning sign(s) or label(s) shall comply with 110.21(B).

(D) Three-phase Supply. Stand-alone systems shall be permitted to supply three-phase, 3-wire or 4-wire systems.

(E) Voltage and Frequency Control. The stand-alone power sources shall be controlled during operation so that voltage and frequency are supplied within limits compatible with the connected loads.

Additional Proposed Changes

File Name	Description	Approved
Article_225_Part_III_Rationale.docx		
Article_225_Part_III.docx		

Statement of Problem and Substantiation for Public Input

The requirements for Stand-Alone Systems are removed from Article 710 and moved with modification to a new Part III of Article 225. A stand-alone system must comply with the applicable sections of the Code but is permitted to have a lower capacity source connection to the building or structure disconnect. This revision will provide consistency and alignment for Stand-Alone Systems with Article 225 Part II that provides requirements for Buildings or Other Structures Supplied by a Feeder(s) or Branch Circuit(s). The modifications of Article 710 requirements included are as follows.

Section 225.80 is based on the scope of Article 710 but revised to remove confusion around island mode operation and stand-alone systems. The definition of a stand-alone system in Article 100 and this revision align and will improve clarity for users. The first sentence of the informational note was removed to eliminate redundancy and use of the undefined term isolated microgrid. An isolated microgrid system may have source requirements that conflict with the source requirements in this article depending upon the loads served.

Section 225.85 is based on Section 710.6 but revised to remove confusion around the term “island mode” and stand-alone systems. The suitability of a power source to supply a stand-alone system is addressed in the listing or field evaluation requirements within this section.

Section 225.90 is based on Section 710.10. The requirements for identification of power sources were revised for clarity. Inclusion of the article title is redundant and adds confusion to the requirement. The phrase "or be grouped with other plaques or directories for other on-site sources" was removed based on requirement to comply with section 705.10.

Section 710.12 was removed since the article does not contain requirements utilizing the Stand-Alone Inverter Input Current determined in this section.

Section 225.95 is based on Section 710.15. The title was revised to align with section content and the section references were adjusted since 710.15(G) was incorrect.

Section 225.95(A) is based on Section 710.15(A). The stand-alone system supply output which supplies the premises wiring system was revised to simplify and improve clarity. Documentation and marking requirements were added to provide necessary system information for operation and maintenance. The informational note was removed since the information is provided in other parts of the Code.

Section 225.95(B) is moved from Section 710.15(B) without modification.

Sections 225.95(C) and (D) are based on Section 710.15(C) and 710.15(D) but revised to remove the term “isolated microgrid”.

Section 710.15(E) was removed since energy storage or backup power are not required for stand-alone systems. The need for backup or standby power will depend upon the type of loads served as covered in the applicable code article.

Section 225.95(E) is moved from Section 710.15(F) without modification.

See the attached Word documents which may be easier to track the changes.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 4087-NFPA 70-2023 [Article 710]	
Public Input No. 4087-NFPA 70-2023 [Article 710]	

Submitter Information Verification

Submitter Full Name:	Chad Kennedy
Organization:	Schneider Electric
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Sep 06 17:12:05 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: The existing article 710 contains the requirements for stand-alone systems. When a stand-alone system is connected using an outside branch circuit or feeder then compliance with Article 225 is mandatory. Not all stand-alone systems will have outdoor feeder or branch circuits.

Article 225 Part III Stand-Alone Systems Rationale

The requirements for Stand-Alone Systems are removed from Article 710 and moved with modification to a new Part III of Article 225. This revision will provide consistency and alignment for Stand-Alone Systems with Article 225 Part II that provides requirements for Buildings or Other Structures Supplied by a Feeder(s) or Branch Circuit(s).

Section 225.80 is based on the scope of Article 710 but revised to remove confusion around island mode operation and stand-alone systems. The definition of a stand-alone system in Article 100 and this revision align and will improve clarity for users. The first sentence of the informational note was removed to eliminate redundancy and use of the undefined term isolated microgrid. An isolated microgrid system may have source requirements that conflict with the source requirements in this article depending upon the loads served.

Section 225.85 is based on Section 710.6 but revised to remove confusion around the term “island mode” and stand-alone systems. The suitability of a power source to supply a stand-alone system is addressed in the listing or field evaluation requirements within this section.

Section 225.90 is based on Section 710.10. The requirements for identification of power sources were revised for clarity. Inclusion of the article title is redundant and adds confusion to the requirement. The phrase "or be grouped with other plaques or directories for other on-site sources" was removed based on requirement to comply with section 705.10.

Section 710.12 was removed since the article does not contain requirements utilizing the Stand-Alone Inverter Input Current determined in this section.

Section 225.95 is based on Section 710.15. The title was revised to align with section content and the section references were adjusted since 710.15(G) was incorrect.

Section 225.95(A) is based on Section 710.15(A). The stand-alone system supply output which supplies the premises wiring system was revised to simplify and improve clarity. Documentation and marking requirements were added to provide necessary system information for operation and maintenance. The informational note was removed since the information is provided in other parts of the Code.

Section 225.95(B) is moved from Section 710.15(B) without modification.

Sections 225.95(C) and (D) are based on Section 710.15(C) and 710.15(D) but revised to remove the term “isolated microgrid”.

Section 710.15(E) was removed since energy storage or backup power are not required in this article. The need for backup or standby power will depend upon the type of loads served as covered in the applicable code article.

Section 225.95(E) is moved from Section 710.15(F) without modification.

Part III Stand-Alone Systems

225.80 General. Part III contains requirements for electric power production systems that supply a stand-alone system.

Informational Note: Stand-alone systems often include a single or a compatible interconnection of sources such as engine generators, solar PV, wind, ESS, or batteries.

225.85 Equipment Approval. All power production equipment or systems shall be approved for the intended use and comply with one of the following:

(1) Be listed

(2) Be evaluated for the application and have a field label applied

225.90 Identification of Power Sources. A permanent plaque, label, or directory shall be installed at each power source disconnecting means location, or at an approved readily visible location. The plaque, label, or directory shall denote the location of each power source disconnecting means for the building. Where multiple sources supply the building, marking shall comply with 705.10.

225.95 Wiring and Supply Capacity. Premises wiring systems shall be adequate to meet the requirements of this Code for similar installations supplied by a feeder or service. The wiring on the supply side of the building or structure disconnecting means shall comply with the requirements of this Code, except as modified by 225.95 (A) through (E).

(A) Supply Output. Power supply to premises wiring systems shall have a capacity rating based on the largest load intended to be operated at one time. Equipment marking and documentation shall be provided as follows:

(1) The supply capacity shall be marked on the equipment containing the system branch circuit overcurrent protective device(s).

(2) Documentation of the load calculation shall be made available to those authorized to inspect, operate, and maintain the system.

(B) Sizing and Protection. The circuit conductors between a stand-alone source and a building or structure disconnecting means shall be sized based on the sum of the output ratings of the stand-alone source(s). For three-phase interconnections, the phase loads shall be controlled or balanced to be compatible with the specifications of the sum of the power supply capacities.

(C) Since 120-Volt Supply. Stand-alone systems shall be permitted to supply 120 volts to single-phase, 3-wire, 120/240-volt service equipment or distribution panels where there are no 240-volt outlets and where there are no multiwire branch circuits. In all installations, the sum of the ratings of the power sources shall be less than the rating of the neutral bus in the service equipment or distribution panel. This equipment shall be marked with the following words or equivalent:

Warning: Single 120-VOLT SUPPLY. DO NOT CONNECT MULTIWIRE BRANCH CIRCUITS!

The warning sign(s) or label(s) shall comply with 110.21(B).

(D) Three-phase Supply. Stand-alone systems shall be permitted to supply three-phase, 3-wire or 4-wire systems.

(E) Voltage and Frequency Control. The stand-alone power sources shall be controlled during operation so that voltage and frequency are supplied within limits compatible with the connected loads.

Public Input No. 1288-NFPA 70-2023 [Section No. 225.42]

~~**225.42** Surge Protection.~~

~~**(A)** Surge-Protective Device.~~

~~Where a feeder supplies any of the following, a surge-protective device (SPD) shall be installed:~~

(1) ~~Dwelling units~~

(2) ~~Dormitory units~~

(3) ~~Guest rooms and guest suites of hotels and motels~~

(4) ~~Areas of nursing homes and limited-care facilities used exclusively as patient sleeping rooms~~

~~**(B)** Location.~~

~~The SPD shall be installed in or adjacent to the distribution equipment 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) .~~

~~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.~~

~~**(C)** Type.~~

~~The SPD shall be a Type 1 or Type 2 SPD.~~

~~**(D)** Replacement.~~

~~Where the distribution equipment supplied by the feeder is replaced, all of the requirements of this section shall apply.~~

~~**(E)** Ratings.~~

~~SPDs shall have a nominal discharge current rating (I_n) 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.~~

Statement of Problem and Substantiation for Public Input

The need for Surge protection for Outside Branch Circuits and feeders is already covered in 215.18. a feeder is a feeder inside or outside. The entire section of 225.42 can be deleted as it just repeats what is in 215.18.

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Submittal Date: Thu Jul 06 15:37:04 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The information located in Article 215 is not applied to Article 225, therefore it is necessary to retain this language in Article 225.

Public Input No. 2382-NFPA 70-2023 [Section No. 225.42]

~~**225.42** Surge Protection.~~

~~**(A)** Surge-Protective Device.~~

~~Where a feeder supplies any of the following, a surge-protective device (SPD) shall be installed:~~

(1) ~~Dwelling units~~

(2) ~~Dormitory units~~

(3) ~~Guest rooms and guest suites of hotels and motels~~

(4) ~~Areas of nursing homes and limited-care facilities used exclusively as patient sleeping rooms~~

~~**(B)** Location.~~

~~The SPD shall be installed in or adjacent to the distribution equipment 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) .~~

> ~~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.~~

~~**(C)** Type.~~

~~The SPD shall be a Type 1 or Type 2 SPD.~~

~~**(D)** Replacement.~~

~~Where the distribution equipment supplied by the feeder is replaced, all of the requirements of this section shall apply.~~

~~**(E)** Ratings.~~

~~SPDs shall have a nominal discharge current rating (I_n) 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.~~

Statement of Problem and Substantiation for Public Input

Deleting 225.42 completely because this requirement is already covered in 215.18 for feeders and adding to 225.42 serves no value. Section 215.18 includes outside feeders and all other types of feeders.

Submitter Information Verification

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Committee:	NEC-P10

Committee Statement

Resolution: The information located in Article 215 is not applied to Article 225, therefore it is necessary to retain this language in Article 225.

Public Input No. 244-NFPA 70-2023 [Section No. 225.42]

~~**225.42** Surge Protection.~~

~~**(A)** Surge-Protective Device.~~

~~Where a feeder supplies any of the following, a surge-protective device (SPD) shall be installed:~~

(1) ~~Dwelling units~~

(2) ~~Dormitory units~~

(3) ~~Guest rooms and guest suites of hotels and motels~~

(4) ~~Areas of nursing homes and limited-care facilities used exclusively as patient sleeping rooms~~

~~**(B)** Location.~~

~~The SPD shall be installed in or adjacent to the distribution equipment 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) .~~

> ~~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.~~

~~**(C)** Type.~~

~~The SPD shall be a Type 1 or Type 2 SPD.~~

~~**(D)** Replacement.~~

~~Where the distribution equipment supplied by the feeder is replaced, all of the requirements of this section shall apply.~~

~~**(E)** Ratings.~~

~~SPDs shall have a nominal discharge current rating (I_n) 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.~~

Statement of Problem and Substantiation for Public Input

Delete this requirement in its entirety. Every feeder that would otherwise be covered by this rule is already covered by 215.18. There is no need to repeat this requirement again.

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Submittal Date: Sat Jan 28 15:09:50 EST 2023
Committee: NEC-P10

Committee Statement

Resolution: The information located in Article 215 is not applied to Article 225, therefore it is necessary to retain this language in Article 225.

Public Input No. 4395-NFPA 70-2023 [Section No. 225.42]

225.42 Surge Protection, 1000 Volts or Less .

(A) Surge-Protective Device.

Where a feeder supplies any of the following, a listed surge-protective device (SPD) shall be installed:

(1) Dwelling units

(2) Dormitory units

(3) Guest rooms and guest suites of hotels and motels

(4) Areas of nursing homes and limited-care facilities used exclusively as patient sleeping rooms

(B) Location.

The SPD shall be installed in or adjacent to the distribution equipment 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).

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.

(C) Type.

The SPD shall be a Type 1 or Type 2 SPD.

(D) Replacement.

Where the distribution equipment supplied by the feeder is replaced, all of the requirements of this section shall apply.

(E) Ratings.

SPDs shall have a nominal discharge current rating (I_n) 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.

Statement of Problem and Substantiation for Public Input

A surge protective device is required to be installed by 225.42(A), but the user must refer to Article 242 to find the requirement that the installed device be listed if it is 1000 volts or less. Other equipment and devices required in Chapter 2 such as Ground-fault circuit-interrupters, arc-fault circuit interrupters, and wall-mounted control devices for required lighting outlets state listing requirements in the section that states the equipment or device is required to be installed. This change would fit with the style of other requirements and allow the user to readily know that listing is a requirement for the installed SPD.

There is also a problem with this requirement if the outside branch circuits and feeders are over 1000 volts but not over 1500 volts dc nominal. These circuits are now covered by the scope of Article 225 and 225.42(A) requires a surge protective device (SPD). However, Part III of Article 242 refers to the overvoltage protection for over 1000 volts as a Surge Arrester. Changing the Title of 225.42 would solve this discrepancy. If it is determined that there is a requirement to install surge protection for outside branch circuits and feeders over 1000 volts but not over 1500 volts dc nominal, it also would be necessary to add a new section or first level subdivision for feeders over 1000 volts but not over 1500 volts dc nominal because the existing 225.42(B), 225.42(C), and 225.42(E) also refer to the SPD.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 4404-NFPA 70-2023 [Section No. 215.18]	
Public Input No. 4415-NFPA 70-2023 [Section No. 230.67]	

Submitter Information Verification

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Submittal Date: Thu Sep 07 14:04:16 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The scope of Article 225 is established within 225.1 and the listing requirement is established in 242.6.

Public Input No. 58-NFPA 70-2023 [Section No. 225.42]

225.42 Surge Protection.

(A) Surge-Protective Device.

Where a feeder supplies any of the following, a surge-protective device (SPD) shall be installed:

(1) Dwelling units

(2) Dormitory units

(3) Guest rooms and guest suites of hotels and motels

(4) Areas of nursing homes and limited-care facilities used exclusively as patient sleeping rooms

Informational Note: See 517.10 (B) – (2) and 210.12(D)(2).

(B) SPD Location.

~~The~~ Type 2 SPD shall be ~~installed in or adjacent to the distribution equipment that is connected~~ connected to the load side of outside feeders or to the load side of the feeder supplying outside branch circuits, for the locations specified in 225.42(A), and shall be installed in or adjacent to the distribution equipment that contains branch circuit overcurrent protective ~~device(s)~~ devices that supply the ~~location~~ locations specified in 225.42(A).

Informational Note: Surge protection is most effective when connected closest to the branch circuit. Surges can be generated from multiple sources including, but not limited to, lightning, the electric utility, or utilization equipment. Lead lengths of conductors to the SPD should be kept as short as possible to reduce let-through voltages.

Exception: In lieu of required Type 2 SPDs, Type 1 SPDs shall be permitted to be connected on the supply side of the feeder disconnecting means and shall be an integral part of the feeder disconnecting means or shall be located immediately adjacent thereto.

(C)– SPD Type.

The SPD shall be a listed Type ~~1 or~~ 2 SPD. A listed Type 1 SPD shall be permitted to be installed in lieu of a Type 2 SPD.

(D) Replacement.

Where the distribution equipment supplied by the feeder is replaced, all of the requirements of this section shall apply.

~~**(E)** Ratings.~~

~~SPDs shall have a nominal discharge current rating (I_n) 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.~~

Statement of Problem and Substantiation for Public Input

SUMMARY:

• These changes are needed for correlation. 2020 NEC® 90.1(B) / 2023 NEC® 90.2(B) "Adequacy": "This Code contains provisions that are CONSIDERED NECESSARY for SAFETY. ...". SPD Type 2 protection is the ESSENTIAL MANDATE to assure that protective electronic devices "such as fire alarm systems, IDCIs, GFCIs. AFCIs and smoke alarms" remain effective. In contrast, an SPD Type 1 protective device is designed for this circuit location as merely a PERMISSIVE ALTERNATIVE that goes beyond what's "considered necessary". Express it that way PERMISSIVELY! To clarify further, when Type 1 SPDs are installed at an SPD Type 1 (ARRESTOR) LOCATION, they are nowhere near this sensitive equipment to be protected.

• Again, these changes are needed for correlation. 2020 NEC® 90.1(A) / 2023 NEC® 90.2(A) "Practical Safeguarding": "... This Code is NOT intended as a DESIGN SPECIFICATION ...". Nominal discharge current rating is a performance specification, not a safety requirement, and must be left to the design specification!

• 2023 NEC® new 242.9 "Indicating" and published UL Standard UL 1449 already adequately require ACTUAL SPD STATUS INDICATION of CONTINUING FUNCTIONALITY of SPDs. Therefore, 2023 NEC® new 225.42(E) is

poorly redundant to that end.
The nominal discharge current DESIGN SPECIFICATION attempts to predict approximately the ENDURANCE LONGEVITY of the SPD and must NOT be used as a PREDICTIVE proxy for SPD CONTINUING FUNCTIONALITY better addressed by ACTUAL INDICATORS required elsewhere in the Code and in the product standard.

• Absolutely NO DATA whatsoever was PRESENTED to substantiate that any safety issue exists for LISTED Type 2 SPDs having a nominal discharge current rating of 3 kA or 5 kA and that Type 2 SPDs so rated inherently cannot adequately and safely protect the intended protective equipment connected to the load side of the feeder disconnect device. Fully capable LISTED Type 2 SPDs were unnecessarily excluded by 2023 NEC® 225.42(E), with no technical basis.

SPECIFICS:
• 2023 NEC® 225.42 for OUTSIDE BRANCH CIRCUITS AND FEEDERS was a "copy-and-paste" extrapolation of NEC® 230.67 for services. 2020 NEC® 230.67 was proposed by Public Input PI-2696-NFPA70-2017 [James Dollard for IBEW]. The intent of that Public Input is to assure that protective electronic devices "such as fire alarm systems, IDCIs, GFCIs, AFCIs and smoke alarms" would not be rendered ineffective due to transient overvoltage damage. As improperly worded in 230.67(C) by FR-8546-NFPA70-2018, the clarity of EXACTLY WHAT was being surge protected became unclear. The equipment to be surge protected is on the LOAD SIDE. There are no "fire alarm systems, IDCIs, GFCIs, AFCIs and smoke alarms" types of equipment installed on the SUPPLY SIDE. This information appears to have been omitted in the Substantiation of Public Input PI-2696-NFPA70-2017. This added 230.67 requirement and the 2023 NEC® 225.42 and 215.18 requirements that followed from 230.67 should have MANDATED SPD Type 2, with PERMISSIVE use of an SPD Type 1 in the service equipment as an allowed PERMISSIVE alternative. The NEC® sets essential to be based upon safety metrics. Performance mandate with no rationale should never be allowed. The added 230.67(E) requirement to include nominal discharge current for an SPD and the 2023 NEC® 225.42(E) and 215.18(E) requirements that followed from 230.67(E) are performance specifications, not safety requirements nor safety measurements. These nominal discharge current parameters must be left to the design specifications and engineering, in compliance with 2020 NEC® 90.1(B) / 2023 NEC® 90.2(B) "Adequacy" for ESSENTIAL safety requirements versus OPTIONAL design specifications.

• 2023 NEC® 225.42(B): CONNECTION LOCATION (in the circuit) is a distinct consideration from PHYSICAL ENCLOSURE-MOUNTING LOCATION. The revised wording was harmonized with appropriate wording from 242.14(A), "... connected anywhere on the load side of a service disconnect overcurrent device required by 230.91 unless installed in accordance with 230.82(8)".

• 2023 NEC® 225.42(E): Nominal discharge current rating is purely a performance specification, NOT a safety requirement, and should be left to the design specification, in compliance with 2020 NEC® 90.1(A) / 2023 NEC® 90.2(A).

• 2023 NEC® 225.42(E): First Revision FR-7689-NFPA70-2020 extrapolated from Public Input PI-3722-NFPA70-2020 [Garret Wernecke of Raycap Inc.] of 230.67(E) wrongly conflated that the SPD specified in 2020 NEC® 230.67 served to protect the SUPPLY SIDE of the service equipment and consequently mandated the lowest value of nominal discharge current rating I(n) (cap-eye-sub-n) permitted to be UL 1449-listed for a Type 1 SPD of 10 kA. Rather than to assure those protective electronic devices on the LOAD SIDE of the service disconnect remained operational, the 230.67 mandate (and consequently new 215.18 and 225.42 mandates) was directed at the LINE SIDE where these "fire alarm system, IDCI, GFCI, AFCI and smoke alarm" protective devices are NOT installed.

These 230.67(E), 215.18(E) and 225.42(E) mandates ignored the entire purpose of an SPD from the UL Safety Standard UL 1449. A listed Type 2 SPDs CAN CONTINUE to have a nominal discharge current rating of a fully-listable 3 kA or 5 kA. This mandate misses the point of listed SPDs installed for generations that are still fully operational, with no reports of insufficient Nominal Discharge Current values.

• Absolutely no supporting data was provided for public review. To date, there is no technical data in support of Public Input PI-3722-NFPA70-2020 or First Revisions FR-8299-NFPA70-2020 and FR-7707-NFPA70-2020, or with any subsequent Public Comments thereto. In order to create a safety mandate as a U. S. national mandate, substantiation of a safety issue MUST be demonstrated. Listed Type 2 SPDs, with nominal discharge current ratings of 3 kA or 5 kA, and protecting equipment on the load side of the service disconnect overcurrent device has been accepted in 2017 (and earlier) NEC® Article 285 and is still being used with no consequences. UL has stated that it has seen no safety issues that would warrant withdrawal of continued listing of Type 2 SPDs with nominal discharge ratings of 3 kA or 5 kA. To mandate this nominal discharge current rating now and further to raise the mandated rating, documentation must be provided to show cause. There has still been no case presented to impose this mandate and to increase its value. (Please note that a nominal discharge current rating of 10 kA has nothing whatsoever to do with the common Short-Circuit Current Rating [SCCR] or Interrupting Rating of COINCIDENTALLY a 10 kA VALUE.)

• The Nominal Discharge Current I(n) attribute is being misrepresented. Nominal discharge current rating I(n) [cap-eye-sub-n] is being used in an attempt to establish the ENDURANCE LONGEVITY of the SPD. This is incorrect, as normal power system events will fail an SPD, regardless of the I(n) rating. It should not be used as a proxy for SPD CONTINUING FUNCTIONALITY or to incite the belief that higher I(n) ratings provide improved protection. SPDs are always selected by VOLTAGE as their function is voltage-dependent.

• Per UL Standard UL 1449 and 2023 NEC® new 242.9 "Indicating", added by Public Input PI-3740-NFPA70-2020 [Rudolph Garza of IAEI] and FR-7957-NFPA70-2020, "an SPD shall provide INDICATION that it is FUNCTIONING PROPERLY".

• 225.42(B) editorial: "device(s)" is contrary to NEC® Style Manual 3.3.3; revise to plural "devices" per NEC® Style Manual 3.3.3.

• I serve on what is now the CSA Technical Subcommittee/Integrated Working Group for CSA-C22.2 No. 269-series CSA Standards for Surge Protective Devices from the 1990s to present, and have been involved in the product engineering of surge protective devices from the late 1970s to present through two employers (General Electric Company and Hubbell Incorporated).

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 46-NFPA 70-2023 [Section No. 230.67]	230.67 is the basis for 225.42 and 215.18 existing.
Public Input No. 75-NFPA 70-2023 [Section No. 215.18]	230.67 is the basis for 225.42 and 215.18 existing.
Public Input No. 46-NFPA 70-2023 [Section No. 230.67]	
Public Input No. 75-NFPA 70-2023 [Section No. 215.18]	

Submitter Information Verification

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Submittal Date: Fri Jan 06 18:03:30 EST 2023
Committee: NEC-P10

Committee Statement

Resolution: The informational note is not necessary. The language in (B) and (C) is correct as written. The need for an SP to have an In Rating of 10kA or more is to ensure the SPD is sufficiently robust to continue providing protection for the safety equipment it is protecting. Outside feeders could provide more opportunity for surge events because they are exposed to natural environmental events.

Public Input No. 84-NFPA 70-2023 [Section No. 225.42]

~~**225.42** Surge Protection.~~

~~**(A)** Surge-Protective Device.~~

~~Where a feeder supplies any of the following, a surge-protective device (SPD) shall be installed:~~

(1) ~~Dwelling units~~

(2) ~~Dormitory units~~

(3) ~~Guest rooms and guest suites of hotels and motels~~

(4) ~~Areas of nursing homes and limited-care facilities used exclusively as patient sleeping rooms~~

~~**(B)** Location.~~

~~The SPD shall be installed in or adjacent to the distribution equipment 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) .~~

~~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.~~

~~**(C)** Type.~~

~~The SPD shall be a Type 1 or Type 2 SPD.~~

~~**(D)** Replacement.~~

~~Where the distribution equipment supplied by the feeder is replaced, all of the requirements of this section shall apply.~~

~~**(E)** Ratings.~~

~~SPDs shall have a nominal discharge current rating (I_n) 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.~~

Statement of Problem and Substantiation for Public Input

With the inclusion of 215.18 there is no reason for this section to exist. It contains the same requirements and applies to all feeders [215.1], not just those that are outdoors [225.1].

Submitter Information Verification

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Submittal Date: Mon Jan 09 16:49:53 EST 2023
Committee: NEC-P10

Committee Statement

Resolution: The information located in Article 215 is not applied to Article 225, therefore it is necessary to retain this language in Article 225.

Public Input No. 804-NFPA 70-2023 [Section No. 225.42(A)]

(A) Surge-Protective Device.

Where a feeder supplies any of the following, a surge-protective device (SPD) shall be installed:

(1) Dwelling units

(2) ~~Dormitory units~~ Dormitories

(3) Guest rooms and guest suites of hotels, motels, and ~~motels~~ dormitories

(4) Areas of nursing homes and limited-care facilities used exclusively as patient sleeping rooms

Statement of Problem and Substantiation for Public Input

OBJECTIVE:
• USABILITY of NEC® and consistent CORRELATION with the defined term's EXTRACTION source NFPA 101® Life Safety Code® regarding INDIVIDUAL guest rooms and individual guest suites of dormitories versus the ENTIRE dormitory occupancy. NEC® Correlation Committee [NEC-AAC] take note.

.
BACKGROUND: Users of NEC® have encountered interpretational discrepancies with the present confusing wording. Presently, interpretation confusion exists to readers of NEC® regarding the use of the term "dormitory UNIT" versus the present definition's ambiguous clause " ... group SLEEPING ACCOMMODATIONS are provided for more than 16 persons who are not members of the same family IN ONE ROOM, OR A SERIES OF CLOSELY ASSOCIATED ROOMS, ...". Because of misinterpretation, it has been interpreted by some AHJs that the "UNIT" itself MUST accommodate "MORE THAN 16 PERSONS".

.
The phrase "IN ONE ROOM, OR A SERIES OF CLOSELY ASSOCIATED ROOMS" refers to "who are NOT MEMBERS of the SAME FAMILY", and does NOT refer to the "group SLEEPING ACCOMMODATIONS" having to be within in ONE room or ONE suite of rooms. Consequently, "dormitory" refers to the ENTIRE building or the ENTIRE space within that building AS AN OCCUPANCY that must accommodate MORE THAN 16 persons, and NOT to EACH specific sleeping room accommodating more than 16 persons.

.
Misuse of the term "dormitory UNIT" has effectively DIMINISHED SAFETY for what are colloquially called "dormitory rooms" that are now wrongly NOT treated as guest rooms or guest suites WITHIN a DORMITORY OCCUPANY. These so-called dormitory UNITS (INDIVIDUAL ROOMS) are being misinterpreted such that intended GFCI, AFCI, SPD and other protection requirements do NOT APPLY for DORMITORY bedrooms, for DORMITORY living rooms, and for closets and hallways INSIDE the so-called dormitory UNIT if that "UNIT" accommodates FEWER THAN 17 OCCUPANTS.

.
NFPA 101® Informational Annex A has long ago addressed this misinterpretation: "A.3.3.68 Dormitory. Rooms within dormitories intended for the use of individuals for combined living and sleeping purposes are guest rooms or guest suites. Examples of dormitories are college dormitories, fraternity and sorority houses, and military barracks."

.
It is essential therefore that the terminology and usage for dormitories and for guest rooms and guest suites of dormitories in NFPA 70® be clarified at this time, CONSISTENT with NFPA 101®, to avoid enforcement confusion between Codes.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 798-NFPA 70-2023 [Definition: Dormitory Unit.]	Clarification of NEC ambiguity in the definition extracted from NFPA 101
Public Input No. 798-NFPA 70-2023 [Definition: Dormitory Unit.]	

Submitter Information Verification

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Submittal Date: Fri May 12 17:32:36 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9091-NFPA 70-2024

Statement: The revised language brings the terms in alignment with building code and other standards. The Correlating Committee will need to review that the use of the term "Dormitories" is applied uniformly across the NEC, as CMP 2 has proposed to revise the definition for "Dormitories."

Added item (5) to align with proposed changes in 215.18.

Public Input No. 141-NFPA 70-2023 [Article 230]

Article 230 Services

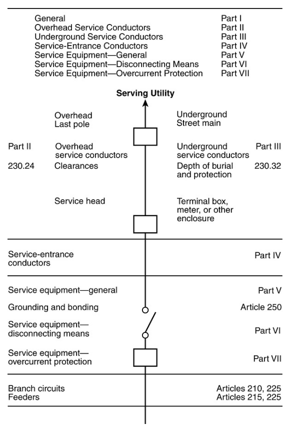
Part I. General

230.1 Scope.

This article covers service conductors and equipment for control and protection of services not over 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.

230.2 Number of Services.

A building or other structure served shall be supplied by only one service unless permitted in 230.2(A) through (D). For the purpose of 230.40, Exception No. 2 only, underground sets of conductors, 1/0 AWG and larger, running to the same location and connected together at their supply end but not connected together at their load end shall be considered to be supplying one service.

(A) Special Conditions.

Additional services shall be permitted to supply the following:

(1) Fire pumps

(2) Emergency systems

(3) Legally required standby systems

(4) Optional standby systems

(5) Interconnected electric power production sources

(6) Systems designed for connection to multiple sources of supply for the purpose of enhanced reliability

(B) Special Occupancies.

By special permission, additional services shall be permitted for either of the following:

(1) Multiple-occupancy buildings where there is no available space for service equipment accessible to all occupants

(2) A single building or other structure sufficiently large to make two or more services necessary

(C) Capacity Requirements.

Additional services shall be permitted under any of the following:

(1) Where the capacity requirements are in excess of 2000 amperes at a supply voltage of 1000 volts or less

(2) Where the load requirements of a single-phase installation are greater than the serving agency normally supplies through one service

(3) By special permission

(D) Different Characteristics.

Additional services shall be permitted for different voltages, frequencies, or phases, or for different uses, such as for different rate schedules.

(E) Identification.

Where a building or structure is supplied by more than one service, or any combination of branch circuits, feeders, and services, a permanent plaque or directory shall be installed at each service disconnect location denoting all other services, feeders, and branch circuits supplying that building or structure and the area served by each. See 225.37.

230.3 One Building or Other Structure Not to Be Supplied Through Another.

Service conductors supplying a building or other structure shall not pass through the interior of another building or other structure.

230.6 Conductors Considered Outside the Building ~~.~~ or Other Structure

Conductors shall be considered outside of a building or other structure under any of the following conditions:

(1) Where installed under not less than 50 mm (2 in.) of concrete beneath a building or other structure

(2) Where installed within a building or other structure in a raceway that is encased in concrete or brick not less than 50 mm (2 in.) thick

(3) Where installed in any vault that meets the construction requirements of Part III of Article 450

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

(5) Where installed within rigid metal conduit (RMC) or intermediate metal conduit (IMC) used to accommodate the clearance requirements in 230.24 and routed directly through an eave but not a wall of a building or other structure

230.7 Other Conductors.

Circuit conductors other than service conductors, shall not be installed in the same raceway, cable, handhole enclosure, or underground box as the service conductors.

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.

230.8 Raceway Seal.

Where a service raceway enters a building or structure, it shall be sealed in accordance with 300.5(G) and 300.7(A). Spare or unused raceways shall also be sealed. Sealants shall be identified for use with the cable insulation, conductor insulation, bare conductor, shield, or other components.

230.9 Clearances on Buildings ~~.~~ or Other Structures

Service conductors and final spans shall comply with 230.9(A), (B), and (C).

(A) Clearances.

Service conductors installed as open conductors or multiconductor cable without an overall outer jacket shall have a clearance of not less than 900 mm (3 ft) from windows that are designed to be opened, doors, porches, balconies, ladders, stairs, fire escapes, or similar locations.

Exception: Conductors run above the top level of a window shall be permitted to be less than the 900 mm (3 ft) requirement.

(B) Vertical Clearance.

The vertical clearance of final spans above, or within 900 mm (3 ft) measured horizontally of platforms, projections, or surfaces that will permit personal contact shall be maintained in accordance with 230.24(B).

(C) Building Openings.

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

230.10 Vegetation as Support.

Vegetation such as trees shall not be used for support of overhead service conductors or service equipment.

Part II. Overhead Service Conductors

230.22 Insulation or Covering.

Individual conductors shall be insulated or covered.

Exception: The grounded conductor of a multiconductor cable shall be permitted to be bare.

230.23 Size and Ampacity.

(A) General.

Conductors shall have sufficient ampacity to carry the current for the load as calculated in accordance with Parts II through V of Article 220 and shall have adequate mechanical strength.

(B) Minimum Size.

The conductors shall not be smaller than 8 AWG copper or 6 AWG aluminum or copper-clad aluminum.

Exception: Conductors supplying only limited loads of a single branch circuit — such as small polyphase power, controlled water heaters, and similar loads — shall not be smaller than 12 AWG hard-drawn copper or equivalent.

(C) Grounded Conductors.

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

230.24 Clearances.

Overhead service conductors shall not be readily accessible and shall comply with 230.24(A) through (E) for services not over 1000 volts, nominal.

(A) Above Roofs.

Conductors shall have a vertical clearance of not less than 2.6 m (8 ft 6 in.) above the roof surface. The vertical clearance above the roof level shall be maintained for a distance of not less than 900 mm (3 ft) in all directions from the edge of the roof.

Exception No. 1: The area above a roof surface subject to pedestrian or vehicular traffic shall have a vertical clearance from the roof surface in accordance with the clearance requirements of 230.24(B).

Exception No. 2: Where the voltage between conductors does not exceed 300 and the roof has a slope of 100 mm in 300 mm (4 in. in 12 in.) or greater, a reduction in clearance to 900 mm (3 ft) shall be permitted.

Exception No. 3: Where the voltage between conductors does not exceed 300, a reduction in clearance above only the overhanging portion of the roof to not less than 450 mm (18 in.) shall be permitted if (1) not more than 1.8 m (6 ft) of overhead service conductors, 1.2 m (4 ft) horizontally, pass above the roof overhang, and (2) they are terminated at a through-the-roof raceway or approved support.

Informational Note: See 230.28 for mast supports.

Exception No. 4: The requirement for maintaining the vertical clearance 900 mm (3 ft) from the edge of the roof shall not apply to the final conductor span where the service drop or overhead service conductors are attached to the side of a building.

Exception No. 5: Where the voltage between conductors does not exceed 300 and the roof area is guarded or isolated, a reduction in clearance to 900 mm (3 ft) shall be permitted.

(B) Vertical Clearance for Overhead Service Conductors.

Overhead service conductors, where not in excess of 1000 volts, nominal, shall have the following minimum clearance from final grade:

(1) 3.0 m (10 ft) — at the electrical service entrance to buildings, also at the lowest point of the drip loop of the building electrical entrance, and above areas or sidewalks accessible only to pedestrians, measured from final grade or other accessible surface only for overhead service conductors supported on and cabled together with a grounded bare messenger where the voltage does not exceed 150 volts to ground

(2) 3.7 m (12 ft) — over residential property and driveways, and those commercial areas not subject to truck traffic where the voltage does not exceed 300 volts to ground

(3) 4.5 m (15 ft) — for those areas listed in the 3.7 m (12 ft) classification where the voltage exceeds 300 volts to ground

(4) 5.5 m (18 ft) — over public streets, alleys, roads, parking areas subject to truck traffic, driveways on other than residential property, and other land such as cultivated, grazing, forest, and orchard

(5) 7.5 m (24½ ft) over tracks of railroads

(C) Clearance from Building Openings.

Clearances from building openings shall comply with 230.9(C).

(D) Clearance from Swimming Pools, Fountains, and Similar Installations.

Clearances from swimming pools, fountains, and similar installations shall comply with 680.9.

(E) Clearance from Communication Wires and Cables.

Clearance from communication wires and cables shall be in accordance with 800.44(A)(4).

230.26 Point of Attachment.

The point of attachment of the overhead service conductors to a building or other structure shall provide the minimum clearances as specified in 230.9 and 230.24. In no case shall this point of attachment be less than 3.0 m (10 ft) above finished grade.

230.27 Means of Attachment.

Multiconductor cables used for overhead service conductors shall be attached to buildings or other structures by fittings identified for use with service conductors. Open conductors shall be attached to fittings identified for use with service conductors or to noncombustible, nonabsorbent insulators securely attached to the building or other structure.

230.28 Service Masts as Supports.

Only power service-drop or overhead service conductors shall be permitted to be attached to a service mast. Service masts used for the support of service-drop or overhead service conductors shall be installed in accordance with 230.28(A) and (B).

(A) Strength.

The service mast shall be of adequate strength or be supported by braces or guy wires to withstand safely the strain imposed by the service-drop or overhead service conductors. Hubs intended for use with a conduit that serves as a service mast shall be identified for use with service-entrance equipment.

(B) Attachment.

Service-drop or overhead service conductors shall not be attached to a service mast between a weatherhead or the end of the conduit and a coupling, where the coupling is located above the last point of securement to the building or other structure or is located above the building or other structure.

230.29 Supports over Buildings.

Service conductors passing over a roof shall be securely supported by substantial structures. For a grounded system, where the substantial structure is metal, it shall be bonded by means of a bonding jumper and listed connector to the grounded overhead service conductor. Where practicable, such supports shall be independent of the building.

Part III. Underground Service Conductors

230.30 Installation.

(A) Insulation.

Underground service conductors shall be insulated for the applied voltage.

Exception: A grounded conductor shall be permitted to be uninsulated as follows:

(1) Bare copper used in a raceway

(2) Bare copper for direct burial where bare copper is approved for the soil conditions

(3) Bare copper for direct burial without regard to soil conditions where part of a cable assembly identified for underground use

(4) Aluminum or copper-clad aluminum without individual insulation or covering where part of a cable assembly identified for underground use in a raceway or for direct burial

(B) Wiring Methods.

Underground service 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) RMC conduit

(2) IMC conduit

(3) Type NUCC conduit

(4) HDPE conduit

(5) PVC conduit

(6) RTRC conduit

(7) Type IGS cable

(8) Type USE conductors or cables

(9) Type MV or Type MC cable identified for direct burial applications

(10) Type MI cable where suitably protected against physical damage and corrosive conditions

(11) Type TC-ER cable where identified for service entrance use and direct burial applications

230.31 Size and Ampacity.

(A) General.

Underground service conductors shall have sufficient ampacity to carry the current for the load as calculated in accordance with Parts II through V of Article 220.

(B) Minimum Size.

The conductors shall not be smaller than 8 AWG copper or 6 AWG aluminum or copper-clad aluminum.

Exception: Conductors supplying only limited loads of a single branch circuit — such as small polyphase power, controlled water heaters, and similar loads — shall not be smaller than 12 AWG copper or 10 AWG aluminum or copper-clad aluminum.

(C) Grounded Conductors.

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

230.32 Protection Against Damage.

Underground service conductors shall be protected against damage in accordance with 300.5. Service conductors entering a building or other structure shall be installed in accordance with 230.6 or protected by a raceway wiring method identified in 230.43.

230.33 Spliced Conductors.

Service conductors shall be permitted to be spliced or tapped in accordance with 110.14, 230.46, 300.5(E), 300.13, and 300.15.

Part IV. Service-Entrance Conductors

230.40 Number of Service-Entrance Conductor Sets.

Each service drop, set of overhead service conductors, set of underground service conductors, or service lateral shall supply only one set of service-entrance conductors.

Exception No. 1: A building with more than one occupancy shall be permitted to have one set of service-entrance conductors for each service, as permitted in 230.2, run to each occupancy or group of occupancies. If the number of service disconnect locations for any given classification of service does not exceed six, the requirements of 230.2(E) shall apply at each location. If the number of service disconnect locations exceeds six for any given supply classification, the following conditions shall apply:

(1) All service disconnect locations for all supply characteristics, together with any branch circuit or feeder supply sources, shall be clearly described using graphics or text, or both, on one or more plaques

(2) The plaques shall be located in an approved, readily accessible location(s) on the building or structure served and as near as practicable to the point(s) of attachment or entry(ies) for each service drop or service lateral and for each set of overhead or underground service conductors.

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

Exception No. 3: A one-family dwelling unit and its accessory structures shall be permitted to have one set of service-entrance conductors run to each from a single service drop, set of overhead service conductors, set of underground service conductors, or service lateral.

Exception No. 4: Two-family dwellings, multifamily dwellings, and multiple occupancy buildings shall be permitted to have one set of service-entrance conductors installed to supply the circuits covered in 210.25.

Exception No. 5: One set of service-entrance conductors connected to the supply side of the normal service disconnecting means shall be permitted to supply each or several systems covered by 230.82(5) or 230.82(6).

230.41 Insulation of Service-Entrance Conductors.

Service-entrance conductors entering or on the exterior of buildings or other structures shall be insulated.

Exception: A grounded conductor shall be permitted to be uninsulated as follows:

(1) Bare copper used in a raceway or part of a service cable assembly

(2) Bare copper for direct burial where bare copper is approved for the soil conditions

(3) Bare copper for direct burial without regard to soil conditions where part of a cable assembly identified for underground use

(4) Aluminum or copper-clad aluminum without individual insulation or covering where part of a cable assembly or identified for underground use in a raceway, or for direct burial

(5) Bare conductors used in an auxiliary gutter

230.42 Minimum Size and Ampacity.

(A) General.

Service-entrance conductors shall have an ampacity of not less than the maximum load to be served. Conductors shall be sized not less than the largest of 230.42(A)(1) or (A)(2). Loads shall be determined in accordance with Part III, IV, or V of Article 220, as applicable. Ampacity shall be determined from 310.14 and shall comply with 110.14(C). The maximum current of busways shall be that value for which the busway has been listed or labeled.

Informational Note: See UL 857, *Standard for Safety for Busways*, for information on busways.

(1) Continuous and Noncontinuous Loads.

Where the service-entrance conductors supply continuous loads or any combination of noncontinuous and continuous loads, the minimum service-entrance conductor size shall have an ampacity not less than the sum of the noncontinuous loads plus 125 percent of continuous loads.

Exception No. 1: Grounded conductors that are not connected to an overcurrent device shall be permitted to be sized at 100 percent of the sum of the continuous and noncontinuous load.

Exception No. 2: The sum of the noncontinuous load and the continuous load if the service-entrance conductors terminate in an overcurrent device where both the overcurrent device and its assembly are listed for operation at 100 percent of their rating shall be permitted.

(2) Application of Adjustment or Correction Factors.

The minimum service-entrance conductor size shall have an ampacity not less than the maximum load to be served after the application of any adjustment or correction factors.

(B) Specific Installations.

In addition to the requirements of 230.42(A), the minimum ampacity for ungrounded conductors for specific installations shall not be less than the rating of the service disconnecting means specified in 230.79(A) through (D).

(C) Grounded Conductors.

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

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

230.44 Cable Trays.

Cable tray systems shall be permitted to support service-entrance conductors. Cable trays used to support service-entrance conductors shall contain only service-entrance conductors and shall be limited to the following methods:

(1) Type SE cable

(2) Type MC cable

(3) Type MI cable

(4) Type IGS cable

(5) Single conductors 1/0 and larger that are listed for use in cable tray

(6) Type TC-ER cable

Such cable trays shall be identified with permanently affixed labels with the wording “Service-Entrance Conductors.” The labels shall be located so as to be visible after installation with a spacing not to exceed 3 m (10 ft) so that the service-entrance conductors are able to be readily traced through the entire length of the cable tray.

Exception: Conductors, other than service-entrance conductors, shall be permitted to be installed in a cable tray with service-entrance conductors, provided a solid fixed barrier identified for use with the cable tray is installed to separate the service-entrance conductors from other conductors installed in the cable tray.

230.46 Spliced and Tapped Conductors.

Service-entrance conductors shall be permitted to be spliced or tapped in accordance with 110.14, 300.5(E), 300.13, and 300.15. Power distribution blocks, pressure connectors, and devices for splices and taps shall be listed. Power distribution blocks installed on service conductors shall be marked “suitable for use on the line side of the service equipment” or equivalent.

Pressure connectors and devices for splices and taps installed on service conductors shall be marked “suitable for use on the line side of the service equipment” or equivalent.

230.50 Protection Against Physical Damage.

(A) Underground Service-Entrance Conductors.

Underground service-entrance conductors shall be protected against physical damage in accordance with 300.5.

(B) All Other Service-Entrance Conductors.

All other service-entrance conductors, other than underground service entrance conductors, shall be protected against physical damage as specified in 230.50(B)(1) or (B)(2).

(1) Service-Entrance Cables.

Service-entrance cables, where subject to physical damage, shall be protected by any of the following:

(1) Rigid metal conduit (RMC)

(2) Intermediate metal conduit (IMC)

(3) Schedule 80 PVC conduit

(4) Electrical metallic tubing (EMT)

(5) Reinforced thermosetting resin conduit (RTRC)

(6) Other approved means

(2) Other Than Service-Entrance Cables.

Individual open conductors and cables, other than service-entrance cables, shall not be installed within 3.0 m (10 ft) of grade level or where exposed to physical damage.

Exception: Type MI and Type MC cable shall be permitted within 3.0 m (10 ft) of grade level where not exposed to physical damage or where protected in accordance with 300.5(D).

230.51 Mounting Supports.

Service-entrance cables or individual open service-entrance conductors shall be supported as specified in 230.51(A), (B), or (C).

(A) Service-Entrance Cables.

Service-entrance cables shall be supported by straps or other approved means within 300 mm (12 in.) of every service head, gooseneck, or connection to a raceway or enclosure and at intervals not exceeding 750 mm (30 in.).

(B) Other Cables.

Cables that are not approved for mounting in contact with a building or other structure shall be mounted on insulating supports installed at intervals not exceeding 4.5 m (15 ft) and in a manner that maintains a clearance of not less than 50 mm (2 in.) from the surface over which they pass.

(C) Individual Open Conductors.

Individual open conductors shall be installed in accordance with Table 230.51(C). Where exposed to the weather, the conductors shall be mounted on insulators or on insulating supports attached to racks, brackets, or other approved means. Where not exposed to the weather, the conductors shall be mounted on glass or porcelain knobs.

Table 230.51(C) Supports

Maximum Volts	Maximum Distance Between Supports		-	Minimum Clearance				
			-	Between Conductors		-	From Surface	
	m	ft	-	mm	in.	-	mm	in.
1000	2.7	9	-	150	6	-	50	2
1000	4.5	15	-	300	12	-	50	2
300	1.4	4½	-	75	3	-	50	2
1000*	1.4*	4½*	-	65*	2½*	-	25*	1*

*Where not exposed to weather.

230.52 Individual Conductors Entering Buildings or Other Structures.

Where individual open conductors enter a building or other structure, they shall enter through roof bushings or through the wall in an upward slant through individual, noncombustible, nonabsorbent insulating tubes. Drip loops shall be formed on the conductors before they enter the tubes.

230.53 Raceways to Drain.

Where exposed to the weather, raceways enclosing service-entrance conductors shall be listed or approved for use in wet locations and arranged to drain. Where embedded in masonry, raceways shall be arranged to drain.

230.54 Overhead Service Locations.

(A) Service Head.

Service raceways shall be equipped with a service head at the point of connection to service-drop or overhead service conductors. The service head shall be listed for use in wet locations.

(B) Service-Entrance Cables Equipped with Service Head or Gooseneck.

Service-entrance cables shall be equipped with a service head. The service head shall be listed for use in wet locations.

Exception: Type SE cable shall be permitted to be formed in a gooseneck and taped with a self-sealing weather-resistant thermoplastic.

(C) Service Heads and Goosenecks Above Service-Drop or Overhead Service Attachment.

Service heads on raceways or service-entrance cables and goosenecks in service-entrance cables shall be located above the point of attachment of the service-drop or overhead service conductors to the building or other structure.

Exception: Where it is impracticable to locate the service head or gooseneck above the point of attachment, the service head or gooseneck location shall be permitted not farther than 600 mm (24 in.) from the point of attachment.

(D) Secured.

Service-entrance cables shall be held securely in place.

(E) Separately Bushed Openings.

Service heads shall have conductors of different potential brought out through separately bushed openings.

Exception: For jacketed multiconductor service-entrance cable without splice.

(F) Drip Loops.

Drip loops shall be formed on individual conductors. To prevent the entrance of moisture, service-entrance conductors shall be connected to the service-drop or overhead service conductors either (1) below the level of the service head or (2) below the level of the termination of the service-entrance cable sheath.

(G) Arranged That Water Will Not Enter Service Raceway or Equipment.

Service-entrance and overhead service conductors shall be arranged so that water will not enter service raceway or equipment.

230.56 Service Conductor with the Higher Voltage to Ground.

On a 4-wire, delta-connected service where the midpoint of one phase winding is grounded, the service conductor having the higher phase voltage to ground shall be durably and permanently marked by an outer finish that is orange in color, or by other effective means, at each termination or junction point.

Part V. Service Equipment — General

230.62 Service Equipment — Enclosed or Guarded.

Energized parts of service equipment shall be enclosed as specified in 230.62(A) or guarded as specified in 230.62(B).

(A) Enclosed.

Energized parts shall be enclosed so that they will not be exposed to accidental contact or shall be guarded as in 230.62(B).

(B) Guarded.

Energized parts that are not enclosed shall be installed on a switchboard, panelboard, or control board and guarded in accordance with 110.18 and 110.27. Where energized parts are guarded as provided in 110.27(A)(1) and (A)(2), a means for locking or sealing doors providing access to energized parts shall be provided.

(C) Barriers.

Barriers shall be placed in service equipment such that no uninsulated, ungrounded service busbar or service terminal is exposed to inadvertent contact by persons or maintenance equipment while servicing load terminations with the service disconnect in the open position.

230.66 Marking.

(A) General.

Service equipment rated at 1000 volts or less shall be marked to identify it as being suitable for use as service equipment. All service equipment shall be listed or field evaluated.

(B) Meter Sockets.

Meter sockets shall not be considered service equipment but shall be listed and rated for the voltage and current rating of the service.

Exception: Meter sockets supplied by and under the exclusive control of an electric utility shall not be required to be listed.

230.67 Surge Protection.

(A) Surge-Protective Device.

All services supplying the following occupancies shall be provided with a surge-protective device (SPD):

(1) Dwelling units

(2) Dormitory units

(3) Guest rooms and guest suites of hotels and motels

(4) Areas of nursing homes and limited-care facilities used exclusively as patient sleeping rooms

Informational Note: See 517.10(B)(2).

(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 at the service equipment as required in 230.67(B) if located at each next level distribution equipment downstream toward the load.

(C) Type.

The SPD shall be a Type 1 or Type 2 SPD.

(D) Replacement.

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

(E) Ratings.

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

Part VI. Service Equipment — Disconnecting Means

230.70 General.

Means shall be provided to disconnect all ungrounded conductors in a building or other structure from the service conductors.

(A) Location.

The service disconnecting means shall be installed in accordance with 230.70(A)(1), (A)(2), and (A)(3).

(1) Readily Accessible Location.

The service disconnecting means shall be installed at a readily accessible location either outside of a building or structure or inside nearest the point of entrance of the service conductors.

(2) Bathrooms.

Service disconnecting means shall not be installed in bathrooms.

(3) Remote Control.

Where a remote control device(s) is used to actuate the service disconnecting means, the service disconnecting means shall be located in accordance with 230.70(A)(1).

(B) Marking.

Each service disconnect shall be permanently marked to identify it as a service disconnect.

(C) Suitable for Use.

Each service disconnecting means shall be suitable for the prevailing conditions. Service equipment installed in hazardous (classified) locations shall comply with the hazardous location requirements.

230.71 Maximum Number of Disconnects.

Each service shall have only one disconnecting means unless the requirements of 230.71(B) are met.

(A) General.

For the purpose of this section, disconnecting means installed as part of listed equipment and used solely for the following shall not be considered a service disconnecting means:

(1) Power monitoring equipment

(2) Surge-protective device(s)

(3) Control circuit of the ground-fault protection system

(4) Power-operable service disconnecting means

(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 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 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 are provided with one service disconnect or multiple service disconnects in separate compartments.

230.72 Grouping of Disconnects.

(A) General.

The two to six disconnects, if permitted in 230.71, shall be grouped. Each disconnect shall be marked to indicate the load served.

Exception: One of the two to six service disconnecting means permitted in 230.71, where used only for a water pump also intended to provide fire protection, shall be permitted to be located remote from the other disconnecting means. If remotely installed in accordance with this exception, a plaque shall be posted at the location of the remaining grouped disconnects denoting its location.

(B) Additional Service Disconnecting Means.

The one or more additional service disconnecting means for fire pumps, emergency systems, legally required standby, or optional standby services permitted by 230.2 shall be installed remote from the one to six service disconnecting means for normal service to minimize the possibility of simultaneous interruption of supply.

(C) Access to Occupants.

In a multiple-occupancy building, each occupant shall have access to the occupant’s service disconnecting means.

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

230.74 Simultaneous Opening of Poles.

Each service disconnect shall simultaneously disconnect all ungrounded service conductors that it controls from the premises wiring system.

230.75 Disconnection of Grounded Conductor.

Where the service disconnecting means does not disconnect the grounded conductor from the premises wiring, other means shall be provided for this purpose in the service equipment. A terminal or bus to which all grounded conductors can be attached by means of pressure connectors shall be permitted for this purpose. In a multisection switchboard or switchgear, disconnects for the grounded conductor shall be permitted to be in any section of the switchboard or switchgear, if the switchboard or switchgear section is marked to indicate a grounded conductor disconnect is located within.

Informational Note: In switchgear or multisection switchboards, the disconnecting means provided for the grounded conductor is typically identified as a neutral disconnect link and is typically located in the bus to which the service grounded conductor is connected.

230.76 Manually or Power Operable.

The service disconnecting means for ungrounded service conductors shall consist of one of the following:

(1) A manually operable switch or circuit breaker equipped with a handle or other suitable operating means

(2) A power-operated switch or circuit breaker, provided the switch or circuit breaker can be opened by hand in the event of a power supply failure

230.77 Indicating.

The service disconnecting means shall plainly indicate whether it is in the open (off) or closed (on) position.

230.79 Rating of Service Disconnecting Means.

The service disconnecting means shall have a rating not less than the calculated load to be carried, determined in accordance with Part III, IV, or V of Article 220, as applicable. In no case shall the rating be lower than specified in 230.79(A), (B), (C), or (D).

(A) One-Circuit Installations.

For installations to supply only limited loads of a single branch circuit, the service disconnecting means shall have a rating of not less than 15 amperes.

(B) Two-Circuit Installations.

For installations consisting of not more than two 2-wire branch circuits, the service disconnecting means shall have a rating of not less than 30 amperes.

(C) One-Family Dwellings.

For a one-family dwelling, the service disconnecting means shall have a rating of not less than 100 amperes, 3-wire.

(D) All Others.

For all other installations, the service disconnecting means shall have a rating of not less than 60 amperes.

230.80 Combined Rating of Disconnects.

Where the service disconnecting means consists of more than one switch or circuit breaker, as permitted by 230.71, the combined ratings of all the switches or circuit breakers used shall not be less than the rating required by 230.79.

230.81 Connection to Terminals.

The service conductors shall be connected to the service disconnecting means by pressure connectors, clamps, or other approved means. Connections that depend on solder shall not be used.

230.82 Equipment Connected to the Supply Side of Service Disconnect.

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

(1) Cable limiters.

(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 DISCONNECTNOT 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 energy management 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:

(12) Meter-mounted transfer switch

(13) Not service equipment

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

230.85 Emergency Disconnects.

For one- and two-family dwelling units, an emergency disconnecting means shall be installed.

(A) General.

(1) Location.

The disconnecting means shall be installed in a readily accessible outdoor location on or within sight of the dwelling unit.

Exception: Where the requirements of 225.41 are met, this section shall not apply.

(2) Rating.

The disconnecting means shall have a short-circuit current rating equal to or greater than the available fault current.

(3) Grouping.

If more than one disconnecting means is provided, they shall be grouped.

(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” includes the factory marking “Service Disconnect”.

(C) Replacement.

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

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

(D) Identification of Other Isolation Disconnects.

Where 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 equipment for isolation of other energy sources shall be located adjacent to the disconnecting means required by this section.

Informational Note: See 445.18, 480.7, 705.20, and 706.15 for examples of other energy source system isolation means.

(E) Marking.

(1) Marking Text.

The disconnecting means shall marked as follows:

(1) Service disconnect

EMERGENCY DISCONNECT, SERVICE DISCONNECT

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

EMERGENCY DISCONNECT, METER DISCONNECT, NOT SERVICE EQUIPMENT

(3) 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 (½ in.) high.

Part VII. Service Equipment — Overcurrent Protection

230.90 Where Required.

Each ungrounded service conductor shall have overload protection.

(A) Ungrounded Conductor.

Such protection shall be provided by an overcurrent device in series with each ungrounded service conductor that has a rating or setting not higher than the ampacity of the conductor. A set of fuses shall be considered all the fuses required to protect all the ungrounded conductors of a circuit. Single-pole circuit breakers, grouped in accordance with 230.71(B), shall be considered as one protective device.

Exception No. 1: For motor-starting currents, ratings that comply with 430.52, 430.62, and 430.63 shall be permitted.

Exception No. 2: Fuses and circuit breakers with a rating or setting that complies with 240.4(B) or (C) and 240.6 shall be permitted.

Exception No. 3: Two to six circuit breakers or sets of fuses shall be permitted as the overcurrent device to provide the overload protection. The sum of the ratings of the circuit breakers or fuses shall be permitted to exceed the ampacity of the service conductors, provided the calculated load does not exceed the ampacity of the service conductors.

Exception No. 4: Overload protection for fire pump supply conductors shall comply with 695.4(B)(2)(a).

Exception No. 5: Overload protection in accordance with the conductor ampacities of 310.12 shall be permitted for single-phase dwelling services.

(B) Not in Grounded Conductor.

No overcurrent device shall be inserted in a grounded service conductor except a circuit breaker that simultaneously opens all conductors of the circuit.

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.

230.92 Locked Service Overcurrent Devices.

Where the service overcurrent devices are locked or sealed or are not readily accessible to the occupant, branch-circuit or feeder overcurrent devices shall be installed on the load side, shall be mounted in a readily accessible location, and shall be of lower ampere rating than the service overcurrent device.

230.93 Protection of Specific Circuits.

Where necessary to prevent tampering, an automatic overcurrent device that protects service conductors supplying only a specific load, such as a water heater, shall be permitted to be locked or sealed where located so as to be accessible.

230.94 Relative Location of Overcurrent Device and Other Service Equipment.

The overcurrent device shall protect all circuits and devices.

Exception No. 1: The service switch shall be permitted on the supply side.

Exception No. 2: High-impedance shunt circuits, surge arresters, Type 1 surge-protective devices, surge-protective capacitors, and instrument transformers (current and voltage) shall be permitted to be connected and installed on the supply side of the service disconnecting means as permitted by 230.82.

Exception No. 3: Circuits for load management devices shall be permitted to be connected on the supply side of the service overcurrent device where separately provided with overcurrent protection.

Exception No. 4: Circuits used only for the operation of fire alarm, other protective signaling systems, or the supply to fire pump equipment shall be permitted to be connected on the supply side of the service overcurrent device where separately provided with overcurrent protection.

Exception No. 5: Meters nominally rated not in excess of 600 volts shall be permitted, provided all metal housings and service enclosures are grounded.

Exception No. 6: Where service equipment is power operable, the control circuit shall be permitted to be connected ahead of the service equipment if suitable overcurrent protection and disconnecting means are provided.

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 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 could make it necessary to review the overall wiring system for proper selective overcurrent protection coordination. Additional installations of ground-fault protective equipment 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 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.

Statement of Problem and Substantiation for Public Input

Adding the words “or Other Structures” in the locations specified will provide better consistency throughout the Article

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 140-NFPA 70-2023 [Article 225]	add “or other structures”

Submitter Information Verification

Submitter Full Name: Russ Leblanc

Organization: Leblanc Consulting Services

Street Address:

City:

State:

Zip:

Submittal Date: Thu Jan 12 07:19:14 EST 2023

Committee: NEC-P10

Committee Statement

Resolution: The submitter has not provided technical substantiation for adding the term “or other structures” wherever the word “building” is shown throughout Article 230.

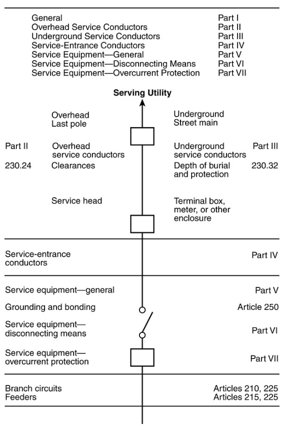
Public Input No. 2633-NFPA 70-2023 [Section No. 230.1]

230.1 Scope.

This article covers service conductors and equipment for control and protection of services not over 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, Part V for services over 1000 volts ac or 1500 volts dc, nominal.

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. The text is revised to to comply with the NEC Style Manual Section 4.1.4, regarding the use of Parts.
4.1.4 References to an Entire Article. References shall not be made to an entire article, except for the Article 100 or where referenced to provide the necessary context. References to specific parts within articles shall be permitted. References to all parts of an article shall not be permitted. The article number shall precede the part number.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 23 21:26:00 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9096-NFPA 70-2024
Statement: The text is revised to comply with the NEC Style Manual section 4.1.4, regarding the use of parts.

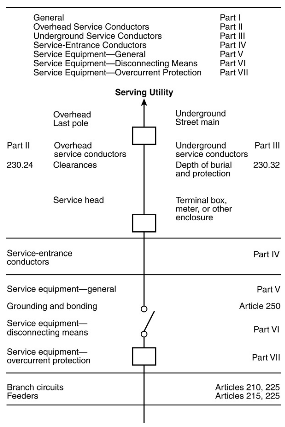
Public Input No. 4320-NFPA 70-2023 [Section No. 230.1]

230.1 Scope.

This article covers service conductors and equipment for control and protection of services not over 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.

<u>Informational Note No. 3 Refer to IEEE C2-2023 National Electrical Safety Code for more more information about safeguarding persons against electrical hazards during the installation, operation and maintenance of electric supply and communication lines.</u>

Statement of Problem and Substantiation for Public Input

The substance of Figure 230.1 reflects agreement on "service point" identified in the IEEE 2023 NESC and should be explicitly referenced here.

Submitter Information Verification

Submitter Full Name: Michael Anthony

Organization: Standards Michigan LLC

Affiliation: IEEE Education & Healthcare Facilities Committee

Street Address:

City:

State:

Zip:

Submittal Date: Thu Sep 07 11:14:35 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: The proposed Informational Note does not improve usability of the document in accordance with NEC Style Manual section 2.1.10.1.

Public Input No. 3679-NFPA 70-2023 [New Section after 230.2]

230.2 Listing Requirements
All service equipment shall be listed or field evaluated.

Statement of Problem and Substantiation for Public Input

The requirement is relocated from 230.66(A) for compliance with the NEC Style Manual Section 2.2.1.

Submitter Information Verification

Submitter Full Name:	Derrick Atkins
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Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Tue Sep 05 13:45:48 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: FR-9102-NFPA 70-2024
Statement: The requirement is relocated from 230.66(A) for compliance with the NEC Style Manual section 2.2.1.

Public Input No. 3148-NFPA 70-2023 [Section No. 230.2]

230.~~2~~ 4 Number of Services.

A building or other structure served shall be supplied by only one service unless permitted in 230.~~2~~ 4 (A) through (D). For the purpose of 230.40, Exception No. 2 only, underground sets of conductors, 1/0 AWG and larger, running to the same location and connected together at their supply end but not connected together at their load end shall be considered to be supplying one service.

(A) Special Conditions.

Additional services shall be permitted to supply the following:

(1) Fire pumps

(2) Emergency systems

(3) Legally required standby systems

(4) Optional standby systems

(5) Interconnected electric power production sources

(6) Systems designed for connection to multiple sources of supply for the purpose of enhanced reliability

(B) Special Occupancies.

By special permission, additional services shall be permitted for either of the following:

(1) Multiple-occupancy buildings where there is no available space for service equipment accessible to all occupants

(2) A single building or other structure sufficiently large to make two or more services necessary

(C) Capacity Requirements.

Additional services shall be permitted under any of the following:

(1) Where the capacity requirements are in excess of 2000 amperes at a supply voltage of 1000 volts or less

(2) Where the load requirements of a single-phase installation are greater than the serving agency normally supplies through one service

(3) By special permission

(D) Different Characteristics.

Additional services shall be permitted for different voltages, frequencies, or phases, or for different uses, such as for different rate schedules.

(E) Identification.

Where a building or structure is supplied by more than one service, or any combination of branch circuits, feeders, and services, a permanent plaque or directory shall be installed at each service disconnect location denoting all other services, feeders, and branch circuits supplying that building or structure and the area served by each. See 225.37.

Statement of Problem and Substantiation for Public Input

This section is being renumbered from 230.2 to 230.4 to comply with the NEC Style Manual 2.2.1.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
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State:
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Submittal Date: Tue Aug 29 16:48:04 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9097-NFPA 70-2024
Statement: This section is being renumbered from 230.2 to 230.4 to comply with the NEC Style Manual section 2.2.1.

Public Input No. 3677-NFPA 70-2023 [Section No. 230.2]

230.~~2~~ 4 Number of Services.

A building or other structure served shall be supplied by only one service unless permitted in 230.2(A) through (D). For the purpose of 230.40, Exception No. 2 only, underground sets of conductors, 1/0 AWG and larger, running to the same location and connected together at their supply end but not connected together at their load end shall be considered to be supplying one service.

(A) Special Conditions.

Additional services shall be permitted to supply the following:

(1) Fire pumps

(2) Emergency systems

(3) Legally required standby systems

(4) Optional standby systems

(5) Interconnected electric power production sources

(6) Systems designed for connection to multiple sources of supply for the purpose of enhanced reliability

(B) Special Occupancies.

By special permission, additional services shall be permitted for either of the following:

(1) Multiple-occupancy buildings where there is no available space for service equipment accessible to all occupants

(2) A single building or other structure sufficiently large to make two or more services necessary

(C) Capacity Requirements.

Additional services shall be permitted under any of the following:

(1) Where the capacity requirements are in excess of 2000 amperes at a supply voltage of 1000 volts or less

(2) Where the load requirements of a single-phase installation are greater than the serving agency normally supplies through one service

(3) By special permission

(D) Different Characteristics.

Additional services shall be permitted for different voltages, frequencies, or phases, or for different uses, such as for different rate schedules.

(E) Identification.

Where a building or structure is supplied by more than one service, or any combination of branch circuits, feeders, and services, a permanent plaque or directory shall be installed at each service disconnect location denoting all other services, feeders, and branch circuits supplying that building or structure and the area served by each. See 225.37.

Statement of Problem and Substantiation for Public Input

The section should be moved to 230.4 for compliance with the NEC Style Manual Section 2.2.1.

Submitter Information Verification

Submitter Full Name: Derrick Atkins
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Zip:

Submittal Date: Tue Sep 05 13:41:41 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: FR-9097-NFPA 70-2024

Statement: This section is being renumbered from 230.2 to 230.4 to comply with the NEC Style Manual section 2.2.1.

Public Input No. 523-NFPA 70-2023 [Section No. 230.2]

230.2 Number of ~~Services~~ Supplies .

A building or other structure ~~served shall~~ supplied by a service, branch circuit, or feeder shall not be supplied by ~~only one~~ another service unless permitted in 230.2(A) through (D). See 225.30.

For the purpose of 230.40, Exception No. 2 only, underground sets of conductors, 1/0 AWG and larger, running to the same location and connected together at their supply end but not connected together at their load end shall be considered to be supplying one service.

(A) Special Conditions.

Additional services shall be permitted to supply the following:

(1) Fire pumps

(2) Emergency systems

(3) Legally required standby systems

(4) Optional standby systems

(5) Interconnected electric power production sources

(6) Systems designed for connection to multiple sources of supply for the purpose of enhanced reliability

(B) Special Occupancies.

By special permission, additional services shall be permitted for either of the following:

(1) Multiple-occupancy buildings where there is no available space for service equipment accessible to all occupants

(2) A single building or other structure sufficiently large to make two or more services necessary

(C) Capacity Requirements.

Additional services shall be permitted under any of the following:

(1) Where the capacity requirements are in excess of 2000 amperes at a supply voltage of 1000 volts or less

(2) Where the load requirements of a single-phase installation are greater than the serving agency normally supplies through one service

(3) By special permission

(D) Different Characteristics.

Additional services shall be permitted for different voltages, frequencies, or phases, or for different uses, such as for different rate schedules.

(E) Identification.

Where a building or structure is supplied by ~~more than one service, or~~ any combination of branch circuits, feeders, and services, ~~a~~ a permanent plaque or directory shall be installed at each service disconnect location denoting all other services, feeders, and branch circuits supplying that building or structure and the area served by each. See 225.37.

Statement of Problem and Substantiation for Public Input

This change coordinates 230.2 with 225.30.

As the two sections are currently written, the disjoint scopes of Articles 225 and 230 permit a building or other structure to be supplied by both a service and a feeder or branch circuit without restriction. If that is the intention, please disregard this PI.

However, if it is the intention that absent one of the specified conditions, a building or other structure should have only one source of supply, be it service, feeder, or branch circuit, then the proposed wording makes that intention explicit, while still dividing the restriction between Article 225 and 230 in accordance with their scopes.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 511-NFPA 70-2023 [Section No. 225.30]	Opposing PI
Public Input No. 524-NFPA 70-2023 [Section No. 225.30 [Excluding any Sub-Sections]]	Coordinating PI for branch circuits and feeders
Public Input No. 524-NFPA 70-2023 [Section No. 225.30 [Excluding any Sub-Sections]]	

Submitter Information Verification

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Zip:
Submittal Date: Fri Mar 31 12:57:12 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: Article 230 addresses service, and does not include feeders and branch circuits.

Public Input No. 4322-NFPA 70-2023 [Section No. 230.2(A)]

(A) Special Conditions.

Additional services shall be permitted to supply the following:

(1) Fire pumps

(2) Emergency systems

(3) Legally required standby systems

(4) Optional standby systems

(5) Interconnected electric power production sources

(6) Systems designed for connection to multiple sources of supply for the purpose of enhanced reliability

Informational Note 1: Refer to "IEEE 1547 Standard for Interconnecting Distributed Resources with Electric Power Systems" for more information about enhancing reliability with renewable electrical sources.

Informational Note 2: Refer to "IEEE 1366-2002 Guide for Electric Power Distribution Reliability Indices" provides information about how to assess utility service point reliability data.

Statement of Problem and Substantiation for Public Input

This proposal is continuation of our effort to drive more community power system (distribution) reliability details into the NEC. Loss of electrical power presents a more frequent hazard than wiring fire safety; especially when communication is impeded. The IEEE catalog is rich in information about reliability solutions on both sides of the service point :

2012 Historical Reliability Data for IEEE 3006 Standards: Power Systems Reliability
https://ieeexplore.ieee.org/document/6745993

Sept 2021 - IEEE Approved Draft Guide for Protection System Redundancy for Power System Reliability
https://ieeexplore.ieee.org/document/9540827

2022 IEEE Guide for Electric Power Distribution Reliability Indices
https://standards.ieee.org/ieee/1366/7243/

There are others.

Expanding thinking to permit individual stand alone residences and free-standing commercial buildings (such as gas stations, pharmacies, grocery stores) to share a single generator with a single natural gas or diesel source is the subject of a proposal I submitted for Article 225. It assumes that multi-building generator sharing (with conformance with all NEC safety canonicals) is too difficult in existing communities but it lights the way for municipalities to modify site regulations to make it possible .

Submitter Information Verification

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Affiliation: StandardsMichigan.COM

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Submittal Date: Thu Sep 07 11:20:41 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The proposed Informational Notes do not improve usability of the document in accordance with NEC Style Manual section 2.1.10.1.

Public Input No. 3725-NFPA 70-2023 [Section No. 230.2(E)]

(E) Identification.

Where a building or structure is supplied by more than one service, ~~or any combination of branch circuits, feeders, and services,~~ a permanent plaque or directory shall be installed at each service disconnect location denoting all other services ~~, feeders, and branch circuits~~ supplying that building or structure and the area served by each. ~~See 225.37 .~~

Statement of Problem and Substantiation for Public Input

Deleting "branch circuits and feeders" from 230.2(E) because this requirement is about buildings supplied from more than one service, not about branch circuits or feeders. The identification placard is a critical component for first responders looking to turn off the power to the building. Additionally, the placard is required at only the Service Disconnect for each building. This proposed revision will add clarity for Code users.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:

Submittal Date: Tue Sep 05 14:56:55 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The plaque is required when a structure is supplied by more than one source, including branch circuits, feeders, and services.

Public Input No. 529-NFPA 70-2023 [Section No. 230.2 [Excluding any Sub-Sections]]

A building or other structure served shall be supplied by only one service unless permitted in 230.2(A) through (D). For the purpose of 230.40, Exception No. 2 only, ~~underground~~ ungrounded sets of conductors, 1/0 AWG and larger, running to the same location and connected together at their supply end but not connected together at their load end shall be considered to be supplying one service.

Statement of Problem and Substantiation for Public Input

Exception No. 2 states "Where two to six service disconnecting means in separate enclosures are grouped at one location and supply separate loads from one service drop, set of overhead service conductors, set of underground service conductors, or service lateral, one set of service-entrance conductors shall be permitted to supply each or several such service equipment enclosures." The change corrects a misspelling, alluding to only underground conductors.

Submitter Information Verification

Submitter Full Name:	David Bredhold
Organization:	Vitok Engineers
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Apr 05 06:38:49 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: Underground is the correct term, and aligns with 310.10(G) with parallel conductors when installed underground.

Public Input No. 3206-NFPA 70-2023 [Section No. 230.3]

230.~~3~~ 5 One Building or Other Structure Not to Be Supplied Through Another.

Service conductors supplying a building or other structure shall not pass through the interior of another building or other structure.

Statement of Problem and Substantiation for Public Input

This section is being renumbered from 230.3 to 230.5 to comply with the NEC Style Manual 2.2.1.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 30 11:12:54 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9106-NFPA 70-2024
Statement: This section is being renumbered from 230.3 to 230.5 to comply with the NEC Style Manual section 2.2.1.

Public Input No. 3678-NFPA 70-2023 [Section No. 230.3]

230.~~3~~ 5 One Building or Other Structure Not to Be Supplied Through Another.

Service conductors supplying a building or other structure shall not pass through the interior of another building or other structure.

Statement of Problem and Substantiation for Public Input

The section should be moved to 230.5 for compliance with the NEC Style Manual Section 2.2.1.

Submitter Information Verification

Submitter Full Name: Derrick Atkins
Organization: Minneapolis Electrical JATC
Street Address:
City:
State:
Zip:

Submittal Date: Tue Sep 05 13:43:15 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9106-NFPA 70-2024

Statement: This section is being renumbered from 230.3 to 230.5 to comply with the NEC Style Manual section 2.2.1.

Public Input No. 2634-NFPA 70-2023 [Section No. 230.6]

230.6 Conductors Considered Outside the Building.

Conductors shall be considered outside of a building or other structure under any of the following conditions:

(1) Where installed under not less than 50 mm (2 in.) of concrete beneath a building or other structure

(2) Where installed within a building or other structure in a raceway that is encased in concrete or brick not less than 50 mm (2 in.) thick

(3) Where installed in any vault that meets the construction requirements of ~~Part III of~~ Article 450 , Part III

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

(5) Where installed within rigid metal conduit (RMC) or intermediate metal conduit (IMC) used to accommodate the clearance requirements in 230.24 and routed directly through an eave but not a wall of a building

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. The text is revised to to comply with the NEC Style Manual Section 4.1.4, regarding the use of Parts.
4.1.4 References to an Entire Article. References shall not be made to an entire article, except for the Article 100 or where referenced to provide the necessary context. References to specific parts within articles shall be permitted. References to all parts of an article shall not be permitted. The article number shall precede the part number.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 23 21:26:49 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9107-NFPA 70-2024
Statement: The text is revised to comply with the NEC Style Manual section 4.1.4, regarding the use of parts.

Public Input No. 3770-NFPA 70-2023 [Section No. 230.6]

230.6 Conductors Considered Outside the Building.

~~Conductors~~ For mechanical protection only, conductors shall be considered outside of a building or other structure under any of the following conditions:

(1) Where installed under not less than 50 mm (2 in.) of concrete beneath a building or other structure

(2) Where installed within a building or other structure in a raceway that is encased in concrete or brick not less than 50 mm (2 in.) thick

(3) Where installed in any vault that meets the construction requirements of Part III of Article 450

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

(5) Where installed within rigid metal conduit (RMC) or intermediate metal conduit (IMC) used to accommodate the clearance requirements in 230.24 and routed directly through an eave but not a wall of a building

Statement of Problem and Substantiation for Public Input

The change is proposed to avoid ambiguity where the interpretation of service conductors considered outside the building is meant to be related to the conductors' mechanical protection. It is unrelated to other properties where additional considerations are needed, such as fire-resistance. It is commonly believed that 2-hour fire-resistance using 2-inches thick concrete may be achieved by claiming that the conductors are treated as outside of the building, which may lead to circuit integrity issues if exposed to a fire event when emergency circuits are required to work uninterruptedly for 2-hours.

The NFPA Research Foundation published a report titled 'Fire Resistance of Concrete for Electrical Conductors' in December 2018 to provide insight to the National Electrical Code regarding concrete encasement meant to protect electrical conductors from the effects of fire, where the document refers to several articles that demonstrate that up to 5 inches of concrete may be required to achieve a certain fire protection. Depending on the installation, even 5 inches of concrete may not be enough to provide thermal protection and maintain the conductor's insulation temperature within the rated range, which may trigger circuit integrity failures.

The proposed wording will help remove the inaccurate association of 2-inches of concrete and 2-hour fire resistance for circuit integrity purposes and will ensure that the 2-inches of concrete is solely considered as a means of mechanical protection.

Submitter Information Verification

Submitter Full Name: Alex Marciano
Organization: Marmon IEI
Street Address:
City:
State:
Zip:
Submittal Date: Tue Sep 05 15:50:27 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: There is no definition of mechanical protection and 230.6 addresses the protection of unprotected conductors entering the building. Fire protection for the integrity for conductors is addressed in other areas of the NEC.

Public Input No. 1517-NFPA 70-2023 [Section No. 230.7]

230.7 Other Conductors.

Circuit conductors other than service conductors, shall not be installed in the same raceway, cable, handhole enclosure, **auxiliary gutters, outlet, pull or junction box, cabinet, panelboard** or underground box as the service conductors.

~~Exception No. 1~~

Exception No. 1 Service conductors are allowed in panelboards, with branch circuit or feeder conductors, in which the service conductors directly serve, but shall not be installed thru a panelboard or other enclosure the service conductors do not directly serve.

Exception No. 2 : Grounding electrode conductors or supply side bonding jumpers or conductors shall be permitted within service raceways.

Exception No. ~~2~~ 3 : Load management control conductors having overcurrent protection shall be permitted within service raceways.

Statement of Problem and Substantiation for Public Input

The present Code language does not allow service conductors and other conductors in the same raceway, handhole enclosures and underground boxes as other conductors. The additional items which have been added with this proposed change is a logical next step to prohibit the interaction of unprotected/unfused conductors (Service conductors) with protected conductors. These new items are similar to the existing items which are not allowed to have service and other circuits intermingled. The separation of service conductors, which obviously do not have overcurrent protection, from other circuit conductors provides a safer installation. As an Electrical Inspector and trainer for the IAEI, I have been asked many times why does this rule apply to wireways but not auxiliary gutters, which are basically the same component, just used in a different manner. The addition of these other enclosures, cabinets and gutters provides consistency in applying the present requirement and create a safer installation.

Submitter Information Verification

Submitter Full Name: Robert Fahey
Organization: Town of Union
Street Address:
City:
State:
Zip:
Submittal Date: Sun Jul 23 12:58:30 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: Technical substantiation has not been provided to include the proposed additional restrictions.

Public Input No. 1761-NFPA 70-2023 [Section No. 230.7]

230.7 Other Conductors.

Circuit conductors other than service conductors, shall not be installed in the same raceway, cable, handhole enclosure, **auxiliary gutters, outlet, pull or junction box, cabinet, enclosed panelboard,** or underground box as the service conductors.

~~Exception No. 1~~ ***Exception No. 1 Service conductors are allowed in enclosed panelboards, with branch circuit or feeder conductors, in which the service conductors directly serve, but shall not be installed thru a enclosed panelboard or other enclosure the service conductors do not directly serve.***

Exception No. 2 : Grounding electrode conductors or supply side bonding jumpers or conductors shall be permitted within service raceways.

Exception No. ~~2~~ 3 : Load management control conductors having overcurrent protection shall be permitted within service raceways.

Statement of Problem and Substantiation for Public Input

The present Code language does not allow service conductors and other conductors in the same raceway, handhole enclosures and underground boxes as other conductors. The additional items which have been added with this proposed change is a logical next step to prohibit the interaction of unprotected/unfused conductors (Service conductors) with protected conductors. These new items are similar to the existing items which are not allowed to have service and other circuits intermingled. The separation of service conductors, which obviously do not have overcurrent protection, from other circuit conductors provides a safer installation. As an Electrical Inspector and trainer for the IAEI, I have been asked why does this rule apply to wireways but not auxiliary gutters, which are basically the same component, just used in a different manner. The addition of these other enclosures, cabinets and gutters provides consistency in applying the present requirement.

Adding new Exception No. 1 and renumbering existing two exceptions respectively.

Submitter Information Verification

Submitter Full Name: Rudy Garza
Organization: IAEI
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 01 12:55:45 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: Technical substantiation has not been provided to include the proposed additional restrictions.

Public Input No. 597-NFPA 70-2023 [Section No. 230.7]

230.7 Other Conductors.

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

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

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

Statement of Problem and Substantiation for Public Input

The comma in the rule is not needed and is marked for deletion. The first exception is also not needed because the requirement only applies to circuit conductors. The conductors exempted via exception 1 are not circuit conductors, so the exception removes a requirement that does not exist to begin with.

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Self-employed
Street Address:
City:
State:
Zip:
Submittal Date: Sat Apr 15 14:27:26 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9108-NFPA 70-2024
Statement: The deletion of the comma was accepted.

The deletion of Exception 1 is not accepted to avoid confusion with regards to grounding electrode conductors.

Public Input No. 2635-NFPA 70-2023 [Section No. 230.23(A)]

(A) General.

Conductors shall have sufficient ampacity to carry the current for the load as calculated in accordance with Article 220, Parts II through ~~V of Article~~ 220 ~~and~~ V and shall have adequate mechanical strength.

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. The text is revised to to comply with the NEC Style Manual Section 4.1.4, regarding the use of Parts.
4.1.4 References to an Entire Article. References shall not be made to an entire article, except for the Article 100 or where referenced to provide the necessary context. References to specific parts within articles shall be permitted. References to all parts of an article shall not be permitted. The article number shall precede the part number.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:

Submittal Date: Wed Aug 23 21:27:52 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9111-NFPA 70-2024
Statement: The text is revised to comply with the NEC Style Manual section 4.1.4, regarding the use of parts.

Public Input No. 854-NFPA 70-2023 [Section No. 230.23(B)]

(B) Minimum Size.

The conductors shall not be smaller than 8 AWG copper or 6 AWG aluminum or copper-clad aluminum.

Exception: Conductors supplying a service supplying only ~~limited loads of~~ a single branch circuit ~~— such as small polyphase power, controlled water heaters, and similar loads —~~ shall not be smaller than ~~12 AWG hard-drawn copper or equivalent~~ 12 AWG copper .

Statement of Problem and Substantiation for Public Input

This exception is far more complex than it needs to be. There is no reason to explain what a single branch circuit is, I think that is understood well enough. The conductor size doesn't change by being hard-drawn or soft drawn, so that language should be removed (note its absence in 230.31(B)). And what is "the equivalent"? If this is referring to copper vs aluminum or copper-clad, that issue is addressed in 110.5.

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Self-employed
Street Address:
City:
State:
Zip:

Submittal Date: Thu May 18 21:48:49 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9113-NFPA 70-2024

Statement: The language is revised for clarity; examples of a single branch circuit are unnecessary. The removal of hard-drawn copper was not made due to the lack of substantiation. It is unclear if that would have negative implications.

Public Input No. 421-NFPA 70-2023 [Section No. 230.24(A)]

(A) Above Roofs.

Conductors shall have a vertical clearance of not less than 2.6 m (8 ft 6 in.) above the roof surface. The vertical clearance above the roof level shall be maintained for a distance of not less than 900 mm (3 ft) in all directions from the edge of the roof.

Exception No. 1: The area above a roof surface subject to pedestrian or vehicular traffic shall have a vertical clearance from the roof surface in accordance with the clearance requirements of 230.24(B).

Exception No. 2: Where the voltage between conductors does not exceed 300 and the roof has a slope of 100 mm in 300 mm (4 in. in 12 in.) or greater, a reduction in clearance to 900 mm (3 ft) shall be permitted.

Exception No. 3: Where the voltage between conductors does not exceed 300, a reduction in clearance above only the overhanging portion of the roof to not less than 450 mm (18 in.) shall be permitted if (1) not more than 1.8 m (6 ft) of overhead service conductors, 1.2 m (4 ft) horizontally, pass above the roof overhang, and (2) they are terminated at a through-the-roof raceway or approved support.

Informational Note: See 230.28 for mast supports.

Exception No. 4: The requirement for maintaining the vertical clearance 900 mm (3 ft) from the edge of the roof shall not apply to the final conductor span where the ~~service drop~~ utility drop or overhead service conductors are attached to the side of a building.

Exception No. 5: Where the voltage between conductors does not exceed 300 and the roof area is guarded or isolated, a reduction in clearance to 900 mm (3 ft) shall be permitted.

Statement of Problem and Substantiation for Public Input

This PI is associated with several other PIs to recommend a global change from “service drop” to “utility drop” and from “service lateral” to “utility lateral.” “Service drop” appears 23 times in the Code and “service lateral” appears 15 times. There are 11 definitions that begin with the word ‘service.’ Of these, 9 are customer owned and only “service drop” and “service lateral” are utility owned and, therefore, outside the scope of the Code. “service drops” and “service laterals” are not service conductors as they do not fit the definition. Confining the word “service” to only those items that are customer owned would clear up much confusion on this topic. Appendix A shows UL 523 as having the title “telephone service drop wire” and the UL standard does, in fact, have that title. However, the text of UL 523 defines this wire as customer owned and Article 805 refers to this wire as a “drop wire.”

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 411-NFPA 70-2023 [Section No. 90.2(D)]	Global change from 'service drop' to 'utility drop' and 'service lateral' to 'utility lateral'
Public Input No. 412-NFPA 70-2023 [Definition: Service Drop.]	Global change from 'service drop' to 'utility drop' and 'service lateral' to 'utility lateral'
Public Input No. 413-NFPA 70-2023 [Definition: Service-Entrance Conductors.]	Global change from 'service drop' to 'utility drop' and 'service lateral' to 'utility lateral'
Public Input No. 414-NFPA 70-2023 [Definition: Distribution Point (Center Yard Pole) (Meter Po...]	Global change from 'service drop' to 'utility drop' and 'service lateral' to 'utility lateral'
Public Input No. 415-NFPA 70-2023 [Definition: Service Lateral.]	Global change from 'service drop' to 'utility drop' and 'service lateral' to 'utility lateral'
Public Input No. 416-NFPA 70-2023 [Section No. 800.44(A)(4)]	Global change from 'service drop' to 'utility drop' and 'service lateral' to 'utility lateral'
Public Input No. 417-NFPA 70-2023 [Section No. 700.12(F)]	Global change from 'service drop' to 'utility drop' and 'service lateral' to 'utility lateral'
Public Input No. 418-NFPA 70-2023 [Section No. 701.12(F)]	Global change from 'service drop' to 'utility drop' and 'service lateral' to 'utility lateral'
Public Input No. 419-NFPA 70-2023 [Section No. 770.44(A)(4)]	Global change from 'service drop' to 'utility drop' and 'service lateral' to 'utility lateral'

Public Input No. 420-NFPA 70-2023 [Section No. 770.44(B)]	Global change from 'service drop' to 'utility drop' and 'service lateral' to 'utility lateral'
Public Input No. 422-NFPA 70-2023 [Section No. 230.40]	Global change from 'service drop' to 'utility drop' and 'service lateral' to 'utility lateral'
Public Input No. 423-NFPA 70-2023 [Section No. 250.24(A)(1)]	Global change from 'service drop' to 'utility drop' and 'service lateral' to 'utility lateral'
Public Input No. 424-NFPA 70-2023 [Section No. 250.24(F)]	Global change from 'service drop' to 'utility drop' and 'service lateral' to 'utility lateral'
Public Input No. 425-NFPA 70-2023 [Section No. 250.64(D)(1)]	Global change from 'service drop' to 'utility drop' and 'service lateral' to 'utility lateral'
Public Input No. 426-NFPA 70-2023 [Section No. 250.66 [Excluding any Sub-Sections]]	Global change from 'service drop' to 'utility drop' and 'service lateral' to 'utility lateral'

Public Input No. 411-NFPA 70-2023 [Section No. 90.2(D)]
Public Input No. 412-NFPA 70-2023 [Definition: Service Drop.]
Public Input No. 413-NFPA 70-2023 [Definition: Service-Entrance Conductors.]
Public Input No. 414-NFPA 70-2023 [Definition: Distribution Point (Center Yard Pole) (Meter Po...]
Public Input No. 415-NFPA 70-2023 [Definition: Service Lateral.]
Public Input No. 416-NFPA 70-2023 [Section No. 800.44(A)(4)]
Public Input No. 417-NFPA 70-2023 [Section No. 700.12(F)]
Public Input No. 418-NFPA 70-2023 [Section No. 701.12(F)]
Public Input No. 419-NFPA 70-2023 [Section No. 770.44(A)(4)]
Public Input No. 420-NFPA 70-2023 [Section No. 770.44(B)]
Public Input No. 422-NFPA 70-2023 [Section No. 230.40]
Public Input No. 423-NFPA 70-2023 [Section No. 250.24(A)(1)]
Public Input No. 424-NFPA 70-2023 [Section No. 250.24(F)]
Public Input No. 425-NFPA 70-2023 [Section No. 250.64(D)(1)]
Public Input No. 426-NFPA 70-2023 [Section No. 250.66 [Excluding any Sub-Sections]]

Submitter Information Verification

Submitter Full Name:	Eric Stromberg
Organization:	Los Alamos National Laboratory
Affiliation:	Self
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Sat Mar 04 16:51:37 EST 2023
Committee:	NEC-P10

Committee Statement

Resolution: “Service drop” is a defined term and is readily understood. Revising this to “utility drop” will create confusion.

Public Input No. 2490-NFPA 70-2023 [Section No. 230.24 [Excluding any Sub-Sections]]

Overhead service conductors <u>not installed in a raceway or cable</u> shall not be readily accessible and shall comply with 230.24(A) through (E) for services not over 1000 volts, nominal.

Statement of Problem and Substantiation for Public Input

This section should be revised to clarify that the clearances in this section apply only to open conductors, not those in a raceway or cable.

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Self-employed
Street Address:
City:
State:
Zip:

Submittal Date: Fri Aug 18 12:26:44 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: Conductors in a cable should continue to be located where they are not readily accessible. Conductors in a raceway are by very definition not readily accessible.

Public Input No. 3718-NFPA 70-2023 [Section No. 230.29]

230.29 Supports over Buildings.

Service conductors passing over a roof shall be securely supported by substantial structures. For a grounded system, where the substantial structure is metal, it shall be bonded by means of a bonding ~~jumper and listed connector to~~ jumper to the grounded overhead service conductor. Where practicable, such supports shall be independent of the building.

Statement of Problem and Substantiation for Public Input

Section 250.8 references that connectors must be listed. Therefore, it is not necessary to restate "and listed connector" in section 230.29. Therefore, this PI would seek to remove this duplication.

Submitter Information Verification

Submitter Full Name: Steve Chutka
Organization: Siemens
Street Address:
City:
State:
Zip:

Submittal Date: Tue Sep 05 14:43:09 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: 250.8 allows for devices other than listed connectors, so the requirement needs to be in 230.29 as currently written. Listed connectors are required, and this is frequently overlooked.

Public Input No. 2636-NFPA 70-2023 [Section No. 230.31(A)]

(A) General.

Underground service conductors shall have sufficient ampacity to carry the current for the load as calculated in accordance with Article 220, Parts II through V ~~of Article 220~~ .

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. The text is revised to to comply with the NEC Style Manual Section 4.1.4, regarding the use of Parts.
4.1.4 References to an Entire Article. References shall not be made to an entire article, except for the Article 100 or where referenced to provide the necessary context. References to specific parts within articles shall be permitted. References to all parts of an article shall not be permitted. The article number shall precede the part number.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 23 21:28:47 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9116-NFPA 70-2024
Statement: The text is revised to comply with the NEC Style Manual section 4.1.4, regarding the use of parts.

Public Input No. 422-NFPA 70-2023 [Section No. 230.40]

230.40 Number of Service-Entrance Conductor Sets.

Each ~~service drop~~ utility drop , set of overhead service conductors, set of underground service conductors, or ~~service lateral~~ utility lateral shall supply only one set of service-entrance conductors.

Exception No. 1: A building with more than one occupancy shall be permitted to have one set of service-entrance conductors for each service, as permitted in 230.2, run to each occupancy or group of occupancies. If the number of service disconnect locations for any given classification of service does not exceed six, the requirements of 230.2(E) shall apply at each location. If the number of service disconnect locations exceeds six for any given supply classification, the following conditions shall apply:

(1) All service disconnect locations for all supply characteristics, together with any branch circuit or feeder supply sources, shall be clearly described using graphics or text, or both, on one or more plaques

(2) The plaques shall be located in an approved, readily accessible location(s) on the building or structure served and as near as practicable to the point(s) of attachment or entry(ies) for each ~~service drop~~ utility drop or ~~service lateral~~ utility lateral and for each set of overhead or underground service conductors.

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

Exception No. 3: A one-family dwelling unit and its accessory structures shall be permitted to have one set of service-entrance conductors run to each from a single ~~service drop~~ utility drop , set of overhead service conductors, set of underground service conductors, or ~~service lateral~~ utility lateral .

Exception No. 4: Two-family dwellings, multifamily dwellings, and multiple occupancy buildings shall be permitted to have one set of service-entrance conductors installed to supply the circuits covered in 210.25.

Exception No. 5: One set of service-entrance conductors connected to the supply side of the normal service disconnecting means shall be permitted to supply each or several systems covered by 230.82(5) or 230.82(6).

Statement of Problem and Substantiation for Public Input

This PI is associated with several other PIs to recommend a global change from “service drop” to “utility drop” and from “service lateral” to “utility lateral.” “Service drop” appears 23 times in the Code and “service lateral” appears 15 times. There are 11 definitions that begin with the word ‘service.’ Of these, 9 are customer owned and only “service drop” and “service lateral” are utility owned and, therefore, outside the scope of the Code. “service drops” and “service laterals” are not service conductors as they do not fit the definition. Confining the word “service” to only those items that are customer owned would clear up much confusion on this topic. Appendix A shows UL 523 as having the title “telephone service drop wire” and the UL standard does, in fact, have that title. However, the text of UL 523 defines this wire as customer owned and Article 805 refers to this wire as a “drop wire.”

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 411-NFPA 70-2023 [Section No. 90.2(D)]	Global change from 'service drop' to 'utility drop' and 'service lateral' to 'utility lateral'
Public Input No. 412-NFPA 70-2023 [Definition: Service Drop.]	Global change from 'service drop' to 'utility drop' and 'service lateral' to 'utility lateral'
Public Input No. 413-NFPA 70-2023 [Definition: Service-Entrance Conductors.]	Global change from 'service drop' to 'utility drop' and 'service lateral' to 'utility lateral'
Public Input No. 414-NFPA 70-2023 [Definition: Distribution Point (Center Yard Pole) (Meter Po...]	Global change from 'service drop' to 'utility drop' and 'service lateral' to 'utility lateral'
Public Input No. 415-NFPA 70-2023 [Definition: Service Lateral.]	Global change from 'service drop' to 'utility drop' and 'service lateral' to 'utility lateral'

Public Input No. 416-NFPA 70-2023 [Section No. 800.44(A)(4)]	Global change from 'service drop' to 'utility drop' and 'service lateral' to 'utility lateral'
Public Input No. 417-NFPA 70-2023 [Section No. 700.12(F)]	Global change from 'service drop' to 'utility drop' and 'service lateral' to 'utility lateral'
Public Input No. 418-NFPA 70-2023 [Section No. 701.12(F)]	Global change from 'service drop' to 'utility drop' and 'service lateral' to 'utility lateral'
Public Input No. 419-NFPA 70-2023 [Section No. 770.44(A)(4)]	Global change from 'service drop' to 'utility drop' and 'service lateral' to 'utility lateral'
Public Input No. 420-NFPA 70-2023 [Section No. 770.44(B)]	Global change from 'service drop' to 'utility drop' and 'service lateral' to 'utility lateral'
Public Input No. 421-NFPA 70-2023 [Section No. 230.24(A)]	Global change from 'service drop' to 'utility drop' and 'service lateral' to 'utility lateral'
Public Input No. 423-NFPA 70-2023 [Section No. 250.24(A)(1)]	Global change from 'service drop' to 'utility drop' and 'service lateral' to 'utility lateral'
Public Input No. 424-NFPA 70-2023 [Section No. 250.24(F)]	Global change from 'service drop' to 'utility drop' and 'service lateral' to 'utility lateral'
Public Input No. 425-NFPA 70-2023 [Section No. 250.64(D)(1)]	Global change from 'service drop' to 'utility drop' and 'service lateral' to 'utility lateral'
Public Input No. 426-NFPA 70-2023 [Section No. 250.66 [Excluding any Sub-Sections]]	Global change from 'service drop' to 'utility drop' and 'service lateral' to 'utility lateral'

Public Input No. 411-NFPA 70-2023 [Section No. 90.2(D)]
Public Input No. 412-NFPA 70-2023 [Definition: Service Drop.]
Public Input No. 413-NFPA 70-2023 [Definition: Service-Entrance Conductors.]
Public Input No. 414-NFPA 70-2023 [Definition: Distribution Point (Center Yard Pole) (Meter Po...]
Public Input No. 415-NFPA 70-2023 [Definition: Service Lateral.]
Public Input No. 416-NFPA 70-2023 [Section No. 800.44(A)(4)]
Public Input No. 417-NFPA 70-2023 [Section No. 700.12(F)]
Public Input No. 418-NFPA 70-2023 [Section No. 701.12(F)]
Public Input No. 419-NFPA 70-2023 [Section No. 770.44(A)(4)]
Public Input No. 420-NFPA 70-2023 [Section No. 770.44(B)]
Public Input No. 421-NFPA 70-2023 [Section No. 230.24(A)]
Public Input No. 423-NFPA 70-2023 [Section No. 250.24(A)(1)]
Public Input No. 424-NFPA 70-2023 [Section No. 250.24(F)]
Public Input No. 425-NFPA 70-2023 [Section No. 250.64(D)(1)]
Public Input No. 426-NFPA 70-2023 [Section No. 250.66 [Excluding any Sub-Sections]]

Submitter Information Verification

Submitter Full Name: Eric Stromberg
Organization: Los Alamos National Laboratory
Affiliation: Self
Street Address:
City:

State:

Zip:

Submittal Date: Sat Mar 04 16:56:26 EST 2023

Committee: NEC-P10

Committee Statement

Resolution: “Service drop” and “service lateral” are defined terms and readily understood. Revising these to “utility drop” and “utility lateral” will create confusion.

Public Input No. 473-NFPA 70-2023 [Section No. 230.42(A)]

(A) General.

Service-entrance conductors shall have an ampacity of not less than the maximum load to be served. Conductors shall be sized not less than the largest of 230.42(A)(1) or (A)(2). Loads shall be determined in accordance with Part III, IV, or V of Article 220, as applicable. Ampacity shall be determined from 310.14 and shall comply with 110.14(C). The maximum current of busways shall be that value for which the busway has been listed or labeled.

Informational Note: See UL 857, *Standard for Safety for Busways*, for information on busways.

(1) ~~Continuous and Noncontinuous Loads~~ Without Adjustment and Correction Factors .

Where the service-entrance conductors supply continuous loads or any combination of noncontinuous and continuous loads, the minimum service-entrance conductor size shall have an ampacity not less than the sum of the noncontinuous loads plus 125 percent of continuous loads.

Exception No. 1: Grounded conductors that are not connected to an overcurrent device shall be permitted to be sized at 100 percent of the sum of the continuous and noncontinuous load.

Exception No. 2: The sum of the noncontinuous load and the continuous load if the service-entrance conductors terminate in an overcurrent device where both the overcurrent device and its assembly are listed for operation at 100 percent of their rating shall be permitted.

(2) ~~Application of Adjustment or~~ With Adjustment and Correction Factors.

The minimum service-entrance conductor size shall have an ampacity not less than the maximum load to be served after the application of any adjustment or correction factors.

Statement of Problem and Substantiation for Public Input

The proposed section headings are borrowed from 690.8(B) and clarify the two different uses of the word "ampacity" in this section. As currently written, the use of the word "ampacity" in section 1 is confusing, because the definition of ampacity and section 310.15 lead to an interpretation that the term "ampacity" always includes the application of adjustment and correction factors.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 471-NFPA 70-2023 [Section No. 210.19(A)]	Identical change for branch circuits
Public Input No. 472-NFPA 70-2023 [Section No. 215.2(A)]	Identical change for feeders
Public Input No. 471-NFPA 70-2023 [Section No. 210.19(A)]	
Public Input No. 472-NFPA 70-2023 [Section No. 215.2(A)]	

Submitter Information Verification

Submitter Full Name: Wayne Whitney
Organization: [Not Specified]
Street Address:
City:
State:
Zip:

Submittal Date: Wed Mar 15 15:07:17 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The headings of 230.42(A)(1) and (2) are clear as written. Revising the headings as proposed could result in confusion as it would imply that list items (1) and (2) are unrelated, when in fact they are related.

Public Input No. 497-NFPA 70-2023 [Section No. 230.42(A)(1)]

(1) Continuous and Noncontinuous Loads.

Where the service-entrance conductors supply continuous loads or any combination of noncontinuous and continuous loads, the minimum service-entrance conductor size shall have an ampacity not less than the sum of the noncontinuous loads plus 125 percent of continuous loads.

Exception No. 1: Grounded conductors that are not connected to an overcurrent device shall be permitted to be sized at 100 percent of the sum of the continuous and noncontinuous load.

Exception No. 2: The sum of the noncontinuous load and the continuous load if the service-entrance conductors terminate in an overcurrent device where both the overcurrent device and its assembly are listed for operation at 100 percent of their rating shall be permitted.

<u>Exception No. 3: Where the service-entrance conductors are protected by a single overcurrent device not exceeding 800A and sized per 215.3 for the loads served, the ampacity of the service-entrance conductors shall be permitted to be not less than the sum of the continuous load plus the noncontinuous load, provided the ampacity is more than the next lower standard rating of overcurrent device in accordance with 240.4(B).</u>

Statement of Problem and Substantiation for Public Input

Recall that the 125% continuous use factor exists in the NEC solely due to the limitation of an overcurrent device installed in an enclosure which may allow heat buildup greater than would occur in the free air testing conditions of the applicable UL standard, possibly resulting in nuisance tripping when the overcurrent device is loaded continuously at its rating. In particular, there is no need to upsize the conductor itself based solely on the continuous loading; the ampacity is by the Article 100 definition a continuous rating. Any need to upsize the conductor derives from the need to upsize the overcurrent device and then to ensure than the conductor is still adequately protected under 240.4.

This amendment proposes to allow the use of 240.4(B) as indicated, which use would otherwise be circumvented by 230.42(A)(1). To illustrate the effect, consider a 48A continuous load (such as EVSEs, an increasingly common new installation) installed with a 60A service overcurrent device and possibly supplied by #6 copper service entrance conductors installed in ENT with a 60C temperature rating. The temperature rating of the ENT limits the conductors to the 60C ampacity column, so before adjustment and correction the conductors have an ampacity of 55A.

Now the 55A rating is a continuous rating, and greater than the 48A continuous load, so the conductors will not be overloaded during normal operating conditions. And 60A is 125% of the 48A continuous load, so the overcurrent device rating complies with 215.3 and should not lead to nuisance tripping. [Compliance with 215.3 for the service overcurrent device would be required when that overcurrent device supplies a single feeder on the its load side and therefore also serves as the feeder overcurrent device.] The only remaining question as far as the safety of the installation is whether a 60A overcurrent device can protect the 55A ampacity conductor with a 48A continuous load during abnormal conditions.

For the case of a non-continuous load of 55A, 240.4(B) does allow a 60A overcurrent device to protect a 55A ampacity conductor. The difference in loading conditions is not material to whether or not the 60A overcurrent device can properly protect a 55A ampacity conductor. That is, for the 55A non-continuous load case, 240.4(B) tells us that the overcurrent device's protection curve is suitably more conservative than the 55A ampacity conductor's damage curve, so that the 55A ampacity conductor is protected. The same confidence about abnormal conditions applies regardless of normal loading conditions, so the 55A ampacity conductor is protected by a 60A overcurrent device for the 48A continuous load case as well.

As such, since the non-continuous configuration discussed is allowed under 240.4(B), the continuous configuration should also be allowed. It is currently disallowed only due to the requirement in 230.42(A)(1) for the 125% continuous use factor. The new exception provides the narrowly tailored relief necessary to apply 240.4(B) to continuous loads.

Related Public Inputs for This Document

Related Input	Relationship

Public Input No. 494-NFPA 70-2023 [Section No. 210.19(A)]	Identical change for branch-circuit conductors
Public Input No. 495-NFPA 70-2023 [Section No. 215.2(A)(1)]	Identical change for feeder conductors
Public Input No. 494-NFPA 70-2023 [Section No. 210.19(A)]	
Public Input No. 495-NFPA 70-2023 [Section No. 215.2(A)(1)]	

Submitter Information Verification

Submitter Full Name:	Wayne Whitney
Organization:	[Not Specified]
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Tue Mar 21 13:58:12 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: The 125% continuous use factor is not related to overcurrent devices installed in enclosures. Exception number 2 already allows conductors to be sized at 100% of continuous and noncontinuous loads when the overcurrent devices and its assembly are listed for operation at 100%.

Public Input No. 857-NFPA 70-2023 [Section No. 230.42(A)(1)]

(1) Continuous and Noncontinuous Loads.

Where the service-entrance conductors supply continuous loads or any combination of noncontinuous and continuous loads, the minimum service-entrance conductor size shall have an ampacity not less than the sum of the noncontinuous loads plus 125 percent of continuous loads.

Exception No. 1: Grounded conductors that are not connected to an overcurrent device shall be permitted to be sized at 100 percent of the sum of the continuous and noncontinuous load.

Exception No. 2: ~~The~~ C onductors shall be permitted to be sized at 100 percent of the sum of the ~~noncontinuous load and the continuous load if the service-entrance conductors~~ continuous and noncontinuous loads if they terminate in an overcurrent device where both the overcurrent device and its assembly are listed for operation at 100 percent of their rating ~~shall be permitted~~ .

Statement of Problem and Substantiation for Public Input

The second exception needs to be revised into a complete sentence. This change should be viewed as editorial only.

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Self-employed
Street Address:
City:
State:
Zip:
Submittal Date: Sun May 21 12:35:39 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9119-NFPA 70-2024
Statement: The text of exception 2 is revised for clarity. The exception is revised into a complete sentence.

Public Input No. 2638-NFPA 70-2023 [Section No. 230.42(A) [Excluding any Sub-Sections]]

Service-entrance conductors shall have an ampacity of not less than the maximum load to be served. Conductors shall be sized not less than the largest of 230.42(A)(1) or (A)(2). Loads shall be determined in accordance with Article 220, Part III, IV, or V ~~of Article 220~~ , as applicable. Ampacity shall be determined from 310.14 and shall comply with 110.14(C). The maximum current of busways shall be that value for which the busway has been listed or labeled.

Informational Note: See UL 857, *Standard for Safety for Busways*, for information on busways.

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. The text is revised to to comply with the NEC Style Manual Section 4.1.4, regarding the use of Parts.
4.1.4 References to an Entire Article. References shall not be made to an entire article, except for the Article 100 or where referenced to provide the necessary context. References to specific parts within articles shall be permitted. References to all parts of an article shall not be permitted. The article number shall precede the part number.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 23 21:29:45 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9117-NFPA 70-2024
Statement: The text is revised to comply with the NEC Style Manual section 4.1.4, regarding the use of parts.

Public Input No. 1307-NFPA 70-2023 [Section No. 230.46]

230.46 Spliced and Tapped Conductors.

Service-entrance conductors shall be permitted to be spliced or tapped in accordance with 110.14, 300.5(E), 300.13, and 300.15. Power distribution blocks, pressure connectors, and devices for splices and taps shall be listed. Power distribution blocks installed on service conductors shall be marked “suitable for use on the line side of the service equipment” or equivalent.

Pressure connectors and devices for splices and taps installed on service conductors shall be ~~marked~~ identified as “suitable for use on the line side of the service equipment” or equivalent.

Informational Note: SVC is considered equivalent to suitable for use on the line side of service equipment.

Statement of Problem and Substantiation for Public Input

Due to the size limitations of these products, inclusion of the suitable for use on the line side of service equipment marking (more than 50 characters of text) may not be practical. This proposal permits this rating to be marked on the connector, the smallest unit container, or on an information sheet placed in the smallest unit container. To cover these marking provisions, the proposal modifies the text by replacing “marked” with “identified”. This proposal would also identify the abbreviation SVC as an option by including this detail in an Informational Note.

Submitter Information Verification

Submitter Full Name: Megan Hayes
Organization: NEMA
Street Address:
City:
State:
Zip:

Submittal Date: Fri Jul 07 16:26:58 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9125-NFPA 70-2024

Statement: The requirements were moved into a list format per the NEC Style Manual section 2.1.8 and 3.5.1. An informational note was added for additional information to describe standard industry identification. Short circuit rating was not added because it was considered to be too restrictive, and no technical substantiation for its inclusion was provided.

Public Input No. 1955-NFPA 70-2023 [Section No. 230.46]

230.46 Spliced and Tapped Conductors.

Service-entrance conductors shall be permitted to be spliced or tapped in accordance with 110.14, 300.5(E), 300.13, and 300.15.- ~~Power distribution blocks, pressure connectors, and devices for splices and taps shall be listed. Power distribution blocks installed~~

The following equipment installed on service conductors shall be listed, have a short-circuit current rating for the available fault current, and be marked "suitable for use on the line side of the service equipment" or equivalent.~~Pressure connectors and devices~~ :

(1) Power distribution blocks

(2) Pressure connectors

(3) Devices for splices and taps- ~~installed on service conductors shall be marked "suitable for use on the line side of the service equipment" or equivalent.~~

Statement of Problem and Substantiation for Public Input

The previous text did not reference that the power distribution blocks or the pressure connectors needed to have a short-circuit current rating for the available fault current. These terminations need to be properly designed and listed for the installation for safety and the proper SSCR is necessary.

This revision reflects a change to a list format to comply with the NEC Style Manual Section 3.5.1.1.

Submitter Information Verification

Submitter Full Name: Rudy Garza
Organization: IAEI
Street Address:
City:
State:
Zip:

Submittal Date: Tue Aug 08 14:23:48 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9125-NFPA 70-2024

Statement: The requirements were moved into a list format per the NEC Style Manual section 2.1.8 and 3.5.1. An informational note was added for additional information to describe standard industry identification. Short circuit rating was not added because it was considered to be too restrictive, and no technical substantiation for its inclusion was provided.

Public Input No. 3026-NFPA 70-2023 [Section No. 230.46]

230.46 Spliced and Tapped Conductors.

Service-entrance conductors shall be permitted to be spliced or tapped in accordance with 110.14, 300.5(E), 300.13, and 300.15. ~~Power distribution blocks, pressure connectors, and devices for splices and taps shall be listed. Power distribution blocks installed~~

The following equipment installed on service conductors shall be listed, have a short-circuit current rating for the available fault current and be marked "suitable for use on the line side of the service equipment" or equivalent. ~~Pressure connectors and devices~~ :

(1) Power distribution blocks

(2) Pressure connectors

(3) Devices for splices and taps ~~installed on service conductors shall be marked "suitable for use on the line side of the service equipment" or equivalent~~ .

Statement of Problem and Substantiation for Public Input

The previous text did not reference that the power distribution blocks or the pressure connectors needed to have a short-circuit current rating for the available fault current. These terminations need to be properly designed and listed for the installation for safety and the proper SSCR is necessary.
This revision reflects a change to a list format to comply with the NEC Style Manual Section 3.5.1.1.

Submitter Information Verification

Submitter Full Name: David Williams

Organization: Delta Charter Township

Street Address:

City:

State:

Zip:

Submittal Date: Mon Aug 28 18:51:19 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: FR-9125-NFPA 70-2024

Statement: The requirements were moved into a list format per the NEC Style Manual section 2.1.8 and 3.5.1. An informational note was added for additional information to describe standard industry identification. Short circuit rating was not added because it was considered to be too restrictive, and no technical substantiation for its inclusion was provided.

Public Input No. 3092-NFPA 70-2023 [Section No. 230.46]

230.46 Spliced and Tapped Conductors.

Service-entrance conductors shall be permitted to be spliced or tapped in accordance with 110.14, 300.5(E), 300.13, and 300.15. Power distribution blocks, pressure connectors, and devices for splices and taps shall be listed. Power distribution blocks installed on service conductors shall be marked ~~“suitable~~ “listed for use on the line side of the service equipment” or equivalent.

Pressure connectors and devices for splices and taps installed on service conductors shall be ~~marked~~ listed for and marked “suitable for use on the line side of the service equipment” or equivalent.

Statement of Problem and Substantiation for Public Input

Being suitable for lineside tap is going to leave the liability on the installing contractor if proper testing and listing is not performed by a NRTL, testing guidelines are available at UL.

What proof is required for "Suitable"

Submitter Information Verification

Submitter Full Name: Larry Beach
Organization: NSI Industries Polaris
Affiliation: Technical director NSI
Street Address:
City:
State:
Zip:

Submittal Date: Tue Aug 29 11:32:42 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The marking specified in 230.46 is specifically the marking required by the standards used for listing of the product.

Public Input No. 3622-NFPA 70-2023 [Section No. 230.46]

230.~~46~~ ~~Spliced~~ 46 Splice and Tapped Conductors ~~.~~
Service-entrance conductors shall be permitted to be spliced or tapped in accordance with 110.14 , 300.5(E) , 300.13 , and 300.15 . Power distribution blocks, pressure connectors, and devices for splices and taps shall be

~~listed. Power distribution blocks installed on service conductors shall be marked “suitable for use on the line side of the service equipment” or equivalent.Pressure connectors and devices for splices and taps installed on service conductors shall be marked~~

all of the following:

(1) Listed

(2) Marked “suitable for use on the line side of the service equipment” or

~~equivalent.~~

equivalent

(3) Have a listed short-circuit current rating equal to or greater than the available fault current

Statement of Problem and Substantiation for Public Input

When power distribution blocks, pressure connectors, and devices for splices and taps are subjected to fault currents, significant thermal energy and mechanical forces occur causing conductor(s) to pull out of their terminals creating a shock hazard and potential ground/arc fault event. Having these components evaluated and listed with short-circuit current ratings equal to or greater than the available fault current ensures the conductor(s) remains properly installed and prevents them from becoming a safety hazard.

Submitter Information Verification

Submitter Full Name: Nathan Lenhardt
Organization: Eaton Bussmann
Street Address:
City:
State:
Zip:
Submittal Date: Tue Sep 05 10:05:51 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9125-NFPA 70-2024
Statement: The requirements were moved into a list format per the NEC Style Manual section 2.1.8 and 3.5.1. An informational note was added for additional information to describe standard industry identification. Short circuit rating was not added because it was considered to be too restrictive, and no technical substantiation for its inclusion was provided.

Public Input No. 3744-NFPA 70-2023 [Section No. 230.46]

230.46 Spliced and Tapped Conductors.

(A) General. Service-entrance conductors shall be permitted to be spliced or tapped in accordance with 110.14, 300.5(E), 300.13, and 300.15. Power distribution blocks, pressure connectors, and devices for splices and taps shall be listed.

(B) Line Side of Service Equipment. Power distribution blocks installed on service conductors shall be marked “suitable for use on the line side of the service equipment” or equivalent. ~~Pressure connectors and devices for splices and taps installed on service conductors shall be marked “suitable for use on the line side of the service equipment” or equivalent.~~

Statement of Problem and Substantiation for Public Input

Breaking up 230.46 into a list item format to facilitate understanding for Code users. In accordance with NFPA Style Manual section 3.5.1.2 additional subdivisions shall be used where multiple requirements can be broken into independent requirements.

Submitter Information Verification

Submitter Full Name: Mike Holt

Organization: Mike Holt Enterprises Inc

Street Address:

City:

State:

Zip:

Submittal Date: Tue Sep 05 15:20:39 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: FR-9125-NFPA 70-2024

Statement: The requirements were moved into a list format per the NEC Style Manual section 2.1.8 and 3.5.1. An informational note was added for additional information to describe standard industry identification. Short circuit rating was not added because it was considered to be too restrictive, and no technical substantiation for its inclusion was provided.

Public Input No. 858-NFPA 70-2023 [Section No. 230.46]

230.46 Spliced and Tapped Conductors.

Service-entrance conductors shall be permitted to be spliced or tapped in accordance with 110.14, 300.5(E), 300.13, and 300.15. ~~Power distribution blocks, pressure connectors, and devices~~ Devices for splices and taps ~~shall be listed. Power distribution blocks~~ installed on service conductors shall be ~~marked "suitable for use on the line side of the service equipment" or equivalent.Pressure connectors and devices for splices and taps installed on service conductors shall~~ listed and be marked "suitable for use on the line side of the service equipment" or equivalent.

Statement of Problem and Substantiation for Public Input

Although the text is a bit difficult to read with Terraview, this PI simply deletes most of the first paragraph and consolidates it with the text of the second paragraph. When the effective date was removed in the 2023 cycle it left two paragraphs that say essentially the same thing.

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Self-employed
Street Address:
City:
State:
Zip:

Submittal Date: Sun May 21 13:06:15 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9125-NFPA 70-2024

Statement: The requirements were moved into a list format per the NEC Style Manual section 2.1.8 and 3.5.1. An informational note was added for additional information to describe standard industry identification. Short circuit rating was not added because it was considered to be too restrictive, and no technical substantiation for its inclusion was provided.

Public Input No. 85-NFPA 70-2023 [Section No. 230.56]

~~**230.56** Service Conductor with the Higher Voltage to Ground.~~

~~On a 4-wire, delta-connected service where the midpoint of one phase winding is grounded, the service conductor having the higher phase voltage to ground shall be durably and permanently marked by an outer finish that is orange in color, or by other effective means, at each termination or junction point.~~

Statement of Problem and Substantiation for Public Input

Section 110.15 already requires this.

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Self-employed
Street Address:
City:
State:
Zip:

Submittal Date: Mon Jan 09 17:07:01 EST 2023
Committee: NEC-P10

Committee Statement

Resolution: The submitter is accurate this is similar to 110.15. However, the redundancy is necessary so that it is not missed for services.

Public Input No. 517-NFPA 70-2023 [Section No. 230.62]

230.62 Service Equipment — Enclosed or ~~Guarded~~ Guarded and Barrier Placement .

Energized parts of service equipment shall be enclosed as specified in 230.62(A) or guarded as specified in 230.62(B). Barriers shall be placed as specified in 230.62(C).

(A) Enclosed.

Energized parts shall be enclosed so that they will not be exposed to accidental contact or shall be guarded as in 230.62(B).

(B) Guarded.

Energized parts that are not enclosed shall be installed on a switchboard, panelboard, or control board and guarded in accordance with 110.18 and 110.27. Where energized parts are guarded as provided in 110.27(A)(1) and (A)(2), a means for locking or sealing doors providing access to energized parts shall be provided.

(C) Barriers.

Barriers shall be placed in service equipment such that no energized, uninsulated, ungrounded service busbar or service terminal is exposed to inadvertent contact by persons or maintenance equipment while servicing load terminations with the service disconnect in the open position.

Statement of Problem and Substantiation for Public Input

This recommendation is intended to require what this submitter is guessing was intended by this requirement. As written for the 2023 edition of the NEC, 230.62(C) does not only apply to energized uninsulated, ungrounded service busbar or service terminal since the word "energized" does not appear in 230.62(C) and the requirement in 230.62 only mentions 230.62(A) and 230.62(B). Further, the word "energized" is included in both 230.62(A) and 230.62(B) which seems to imply that the lack of the word "energized" in 230.62(C) is intentional rather than an inadvertent omission. Finally, the title to 230.62 and an additional sentence is added to 230.62 introducing the barrier placement requirement in 230.62(C).

Submitter Information Verification

Submitter Full Name: Palmer Hickman
Organization: Electrical Training Alliance
Street Address:
City:
State:
Zip:
Submittal Date: Mon Mar 27 17:22:20 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9132-NFPA 70-2024

Statement: The general paragraph is revised to ensure Item (C) is always required. The text in 230.62(C) was revised to clarify that barriers are required to protect against contact with energized parts. The action in 230.62(C) correlates with 215.15.

Public Input No. 860-NFPA 70-2023 [Section No. 230.62]

230.62 Service Equipment — Enclosed or Guarded.

Energized parts of service equipment shall be enclosed ~~as specified in 230.62(A) or~~ or be guarded as specified in 230.62(~~B~~ A).

~~(B)~~

(A) ~~Enclosed.~~

~~Energized parts shall be enclosed so that they will not be exposed to accidental contact or shall be guarded as in 230.62(B) .~~

Guarded.

Energized parts that are not enclosed shall be installed on a switchboard, panelboard, or control board and guarded in accordance with 110.18 and 110.27. Where energized parts are guarded as provided in 110.27(A)(1) and (A)(2), a means for locking or sealing doors providing access to energized parts shall be provided.

(~~C~~ B) Barriers.

Barriers shall be placed in service equipment such that no uninsulated, ungrounded service busbar or service terminal is exposed to inadvertent contact by persons or maintenance equipment while servicing load terminations with the service disconnect in the open position.

Statement of Problem and Substantiation for Public Input

Subsection (A) states nothing that is not already in the charging text of the the section.

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Self-employed
Street Address:
City:
State:
Zip:
Submittal Date: Sun May 21 13:20:18 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The proposed revision does not improve clarity or usability. Enclosed and guarded mean different things.

Public Input No. 1339-NFPA 70-2023 [Section No. 230.62 [Excluding any Sub-Sections]]

Energized parts of service equipment shall be enclosed as specified in 230.62(A) or guarded as specified in 230.62(B). Barriers shall be provided as specified in 230.62(C).

Statement of Problem and Substantiation for Public Input

Adding this proposed language to the parent text of 230.62 ensures the relationship is established to direct the user of the Code to first level subdivision (C). The parent text currently references (A) and (B) only.

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Submittal Date: Sat Jul 08 12:33:42 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9132-NFPA 70-2024

Statement: The general paragraph is revised to ensure Item (C) is always required. The text in 230.62(C) was revised to clarify that barriers are required to protect against contact with energized parts. The action in 230.62(C) correlates with 215.15.

Public Input No. 3675-NFPA 70-2023 [Section No. 230.66(A)]

(A) General.

Service equipment rated at 1000 volts or less shall be marked to identify it as being suitable for use as service equipment. ~~All service equipment shall be listed or field evaluated.~~

Statement of Problem and Substantiation for Public Input

The requirement for Listing of Service Equipment should be located in 230.2 for compliance of the NEC Style Manual Section 2.2.1.

Submitter Information Verification

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Committee:	NEC-P10

Committee Statement

Resolution: FR-9137-NFPA 70-2024

Statement: Listing requirements are being relocated to 230.2 for compliance with the NEC Style Manual section 2.2.1. Removal of “rated at 1000 volts or less” aligns with other proposed actions throughout the scope of CMP 10.

Public Input No. 3165-NFPA 70-2023 [Section No. 230.66(B)]

(B) Meter Sockets.

Meter sockets shall not be considered service equipment but shall be listed and rated for the voltage and current rating of ~~the service~~ each service disconnect .

Exception: Meter sockets supplied by and under the exclusive control of an electric utility shall not be required to be listed.

Statement of Problem and Substantiation for Public Input

Revising text for the meter socket to have a current rating of at least each service disconnect instead of the entire service. For example, if we have a 1,200A service and there are six 200A service disconnects, the meter socket should not have to be rated 1,200A, but only rated for the 200A service disconnect it serves. The revised text will improve usability and add clarity for Code users.

Submitter Information Verification

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Committee:	NEC-P10

Committee Statement

Resolution: Each 200A service disconnect would have a meter and per the existing language would need to be rated 200A. The definition of “service” includes the conductors and equipment connecting the serving utility to the wiring service of the premise. In the example cited, the utility may be supplying 1200A, but the definition of “service” clarifies that the rating of the service is based on the conductors and equipment.

Public Input No. 3424-NFPA 70-2023 [New Section after 230.67]

230.68 Replacement.

If service equipment is replaced, all the requirements of Part III. and Part V. of Article 250 shall apply.

Statement of Problem and Substantiation for Public Input

This public input adds a new section to article 230 that requires all the grounding electrode system and bonding requirements in Part III and V of Article 250 are applicable if service equipment is replaced. This ensures that replaced services are properly grounded and bonded to maintain life and property safety of the premises wiring system. There are many existing homes and buildings that are 75 years or older. Most of those buildings have never been evaluated or reinspected and likely do not have proper grounding and bonding. It is imperative for safety concerns to have the service grounding and bonding for existing homes and buildings be brought up to current codes, especially with the capacity and ampere rating of the service increases. While Figure 230.1 implies that all services are required to comply with the grounding and bonding requirements in Article 250, it is not clear all the grounding electrode system and bonding requirements apply when services are replaced.

The rapid electrification of buildings and the growth of the electric vehicle industry is resulting in homes and buildings needing service replacements to increase capacity and ampere rating to supply appliances and electric vehicle power transfer system equipment. It is essential that the bonding requirements also be evaluated for compliance with Part V of Article 250 as the existing system may no longer be sufficient or adequate for the new service rating. This new sentence ensures the replaced service has proper and effective bonding.

Submitter Information Verification

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Submittal Date: Sat Sep 02 19:05:08 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: It could be incorrectly implied that only parts III and V of Article 250 apply. There are other provisions in Article 250 that apply.

Public Input No. 4103-NFPA 70-2023 [Section No. 230.67]

~~**230.67** Surge Protection.~~

~~**(A)** Surge-Protective Device.~~

~~All services supplying the following occupancies shall be provided with a surge-protective device (SPD):~~

(1) ~~Dwelling units~~

(2) ~~Dormitory units~~

(3) ~~Guest rooms and guest suites of hotels and motels~~

(4) ~~Areas of nursing homes and limited-care facilities used exclusively as patient sleeping rooms~~

~~Informational Note: See 517.10(B)(2) .~~

~~**(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 at the service equipment as required in 230.67(B) if located at each next level distribution equipment downstream toward the load.*~~

~~**(C)** Type.~~

~~The SPD shall be a Type 1 or Type 2 SPD.~~

~~**(D)** Replacement.~~

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

~~**(E)** Ratings.~~

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

Statement of Problem and Substantiation for Public Input

Type-I and Type-II “whole-house” SPDs do offer a basic level of protection from some types of surge events and have been available for some time as an option for those seeking additional protection for their utilization equipment. The electric utility industry continues to support their availability to the consumer as one of many options for additional equipment protection. However, they fall far short of providing effective protection, provide a false sense of security, and are typically marketed using a rating that is meaningless for determining the device’s ability to absorb & dissipate energy, and therefore the required installation and use of these devices should NOT be mandated by the code. The following reasons summarize the why the code should return to the 2017 language for Article 230 through the removal of 230.67.

The first reason whole-house SPDs should not be required is the Use and Application statement of the code itself.

From Article 90.2 Use and Application: “90.2(A) Practical Safeguarding. The purpose of this Code is the practical safeguarding of persons and property from hazards arising from the use of electricity. This Code is not intended as a design specification or an instruction manual for untrained persons.” Please note where it says, “This Code is not intended as a design specification…” [emphasis mine]. Stating in general that a particular type of protection is to be provided for the premise wiring system or the users thereof is not necessarily design guidance and thus falls within the intent of this code. Specifying the device to be used and the location it is to be installed are clearly design requirements, which are clearly NOT within the intent of the code, as stated in the code itself.

The second reason deals not with the code directly, but with the application of the code.

Most jurisdictions that use NFPA 70 apply it to new construction and any subsequent alterations involving the service entrance or main disconnect/main panel. These applications of the code affect the construction or renovation, and in some cases the purchase, cost of a premise – an expense almost exclusively paid by those who are employed or who have recently retired, with both groups having sufficient income or funds to absorb the expense. There are jurisdictions, however, that require a premise to meet the current code under additional situations, namely the sale of the property. What makes requiring compliance to the current code in this situation significant is that it also includes the elderly, who are on fixed income and may be toward the end of their depleted retirement funds. These are the people who purchased, or built, their home under a code edition that is numerous code cycles (could be 50+ year's worth) prior to where we are today. This situation is especially discriminatory towards the elderly, particularly in the post-COVID economy, where prices have not fallen from the significant increases they received through the COVID period. The net result of this combination of code requirements and how they are being applied/enforced is that the elderly of these jurisdictions, who are among the easiest to experience injury and least able to escape from a fire, are now being condemned to remain in premises they are no longer able to properly maintain, premises constructed under prior code requirements that may have, or may develop, hazardous conditions. I believe this to be the absolute opposite of the purpose for and intent of the code.

While the code making panels deal directly with the code language and have traditionally not examined nor made attempt to guide the code enforcement process, they bear a moral obligation to be aware of and to consider the conditions imposed through the application of the code when drafting and establishing the code requirements. The real-world effectiveness of the code is, after all, a product of both the language, and the application, of the code.

The third reason is the general lack of effectiveness of SPD devices located at, or just ahead of, the main disconnect/main panel.

To understand this lack of effectiveness one needs an understanding of the mechanics of the different overvoltage scenarios and their typical causes, and an understanding of how lightning strikes on or near different sections of the grid or premise wiring can affect the system and connected equipment.

(Please note that, although the numbers and calculations I may provide in this section are in reference to typical 120/240 volt single-phase services, the points being illustrated also apply to other service voltages and multi-phase arrangements.)

Even though there is some variance in how they are defined across the electrical, electronics, and electric utility industries, there are four basic scenarios that describe how an over-voltage condition can occur.

The 'Transient' scenario describes an event that is typically singular or having a very short-term grouping of non-cyclical and often asymmetric individual voltage excursion events that occur over a few adjacent cycles (total group duration spanning typically less than ¼ second). These excursions can be very high (many times the peak of the normal a/c waveform), are of very short duration (less than ½ cycle), and can be additive to or subtractive from the normal waveform. While their peak voltage can be very high, the total energy they transfer usually is not. The term "spikes" is often used for this type of over-voltage event. Among the causes for voltage transients are ESD, lightning, contact bounce, and intermittent (faulty) connections or contacts. The main threat transients present is insulation/dielectric/semiconductor punch-through, which is caused when the voltage present exceeds the insulation/stand-off voltage rating of the surrounding materials.

A 'Surge' is an event that usually has a duration from a few cycles up to around one second, is typically symmetrical (or very close to it), usually has a peak of around 110% - 200% of the normal waveform peak voltage, and often exhibits an exponential decay (similar to the "ring" waveform). Common causes of surge events include the switching of larger loads, situations involving high resistances in a circuit conductor path, motor starts, ferro-resonant conditions, and lightning. Because the overvoltage excursions of this waveform have greater duration than that of a transient and the waveform itself is cyclical (though decaying), it presents a problem not only in the possibility of exceeding the insulation/dielectric/semiconductor stand-off voltages of the surrounding materials, it also may possess a significant total excess energy to be dissipated.

A voltage 'Swell' is an event that looks very similar to a 'surge' but has a longer duration, and a typically more geometric/linear decay, if any, while present. Most definitions agree that swells are an overvoltage condition whose peaks are approximately 110% to 180% greater than the normal voltage waveform peaks with a duration lasting from around 1 second to around 1 minute. Common causes for voltage swells include the switching of large loads, poor line regulation, weak common return paths on bipolar circuit configurations, equipment failures, and some fault conditions. In this case there is usually not a threat of exceeding the stand-off voltage of any of the surrounding materials, but there is significant excess energy contained in the swell waveform.

The final scenario is simply an 'Overvoltage' condition. Generally, this is a longer-term condition looking a lot like a 'swell' condition, but lasting significantly longer than 1 minute. Causes include poor (or incorrect) regulation, equipment failures, and weak common return paths on bipolar circuit configurations. Here again, the threat is typically from the large amount of excess energy contained in the waveform and not the peak value.

Let's take a look at how SPDs react to these four scenarios.

To understand how they will react requires a basic understanding of how the typical SPD device functions. Most Type-I and Type-II devices are still based on MOV or TVA/TVS type components. These components work in a fashion very similar to having a series Zener-resistor circuit in that they begin to conduct above a given voltage and dissipate the power flowing through them in the form of heat. A sort of 'soft crowbar' circuit that clips the excessive voltage peaks off the top of the voltage waveform. In most of these devices the components are connected between the line and neutral/ground conductors. More expensive devices all components between the neutral and ground conductors, as well as between each pair of line conductors. The intent is to put a limit on the maximum relative voltage between any two conductors in a given circuit.

When subjected to an overvoltage, the greater the excess energy in the waveform, the greater the energy the SPD components will have to absorb, then dissipate. There is a limit to how much energy can be absorbed before the SPD components start becoming damaged themselves, which weakens their ability to absorb energy and leads to eventual SPD device failure.

Applying that to the overvoltage scenarios:

Given the typical construction of SPDs they do quite well managing transients. For low-excess-energy waveforms they can easily dissipate those excesses. Under these conditions the typical SPD can last a fairly long time before needing replacement.

With the increased excess energy contained in surges, how SPDs fare depends on their rating. The larger the joule rating of the components, the larger the total amount of energy they can absorb, then dissipate, before the SPD components sustain damage. The 'surge' scenario is where the energy in the waveform usually starts weakening the components and SPD failures become more common. Either through one large surge, or a number of smaller yet still damaging surges, SPDs will eventually fail. When they do, if the circuit they are protecting is not tripped off, the equipment connected to that circuit is left unprotected against additional surges until the SPD is replaced. (Note: In the case of whole-house SPDs that 'circuit' would be the entire premise, everything served through the main breaker.)

For both 'swells' and the longer-term 'overvoltage' conditions, the longevity of the SPD device is basically a function of how long you can overheat the SPD components before damage, or failure, occurs. Both of these conditions are highly likely to cause damage, and failure, with just one event. Most SPDs do not fare well under either of these conditions. As with any of the overvoltage scenarios, the greater the excursion of the peaks beyond normal, the greater the energy absorbed by the SPD device components. Minimal swells and over-voltages may not cause immediate failure, but excessive heat from any source damages semiconductor materials and both of these conditions could easily carry enough energy to overheat SPD components.

In the case of lightning strikes, there are again four scenarios:

Lightning strike on the utility primary-side conductors.
Utility primary is protected by lightning arrestors. Utilities typically place lightning protectors on the primary connection of all line equipment, or in very close proximity to that connection point. The main function of these is to protect the equipment itself, but in the case of a distribution transformer is also serves to limit any voltage excursion on the transformer secondary as well, thus providing protection to the connected services. Distribution transformers work on a turns ratio basis, dropping the primary voltage by a fixed ratio to the secondary bushings. Most distribution transformers are connected phase-to-neutral, and the following is based on that configuration.

Distribution system lightning arrestors are available in numerous voltage ratings, the voltage at which they begin to conduct. For a system operating at 25 kV phase-phase the phase-neutral voltage would be 14.4 kV. Typical arrestors for this distribution voltage carry a MCOV (Maximum Continuous Operating Voltage) of approximately 15.3 kV, meaning that they will operate (conduct) when presented with voltages higher than this rating. Looking at the math, 15.3 kV – 14.4 kV = 0.9 kV, or 900 V.

For other distribution voltages the results are similar. Primary-side distribution lightning arrestors limit the voltage excursions seen by the transformer primaries, thus limiting the excursions seen at the transformer secondaries. When these arrestors fail they do so as a short circuit, blowing the fuse in the transformer's connection path to the primary conductor. This protects the service against additional strikes on the primary until the arrestor is replaced and power restored.

The typical residential service is a 120/240 V service. When looking to find the transformer ratio for a split-winding secondary one need only divide the primary voltage by the maximum secondary voltage. For a 25 kV distribution system, transformers connected phase-neutral would see 14.4 kV on the primary which they would then drop to 240 V (leg-leg) for the service. 14, 400 V / 240 V = 60. These transformers have a turns ratio of about 60:1. They divide whatever voltage the primary 'sees' by 60 and present that voltage on the secondary bushings. What this means is that, with the distribution lightning arrestor limiting the primary voltage to 15.3 kV, an overvoltage of about 900 V, this would limit the maximum overvoltage on the 240 V secondary to 900 V / 60 = 15 V. It is worth noting that many state tariffs limit the acceptable service voltage range to +/- 5% of the nominal voltage. 240 V x 5% = 12 V. Thus the 15 V overvoltage is only 3V greater than most tariff limits, and less than what typically causes equipment damage.

An additional protection is afforded to the service by the inductance of the transformer. Inductors oppose changes in current flow. Lightning strikes typically manifest a a short series of very narrow, high-intensity pulses. The narrow nature of the transients often puts them at a frequency higher than what the inductance of the transformer will readily pass, thus the impedance has an attenuating effect on the transient waveform, which provides additional protection for the service.

Lightning strike on the service conductors.
When lightning strikes service conductors directly it often blows the primary-side distribution lightning arrestor in similar fashion to lightning strikes on the primary itself. This is because transformers designed to step down primary voltage by a ratio will boost secondary voltage by that same ration if the secondary side becomes the energy source. Lightning strikes of this sort typically cause damage to the transformer as well.

Looking toward the premise, Type-I and Type-II SPDs will help protect against this type of transient, but because of the amount of energy involved the SPD device will usually sustain damage in the process. Sometimes there is enough energy to cause SPD failure in one event, which leaves the premise unprotected against additional strikes until the SPD is replaced. Because the service conductors are bundled, and the insulation is easily breached by the high voltages in lightning, there is often a fault condition created as a result of the lightning strike, necessitating the replacement of the service conductors.

What is fortunate is that this scenario is actually comparatively rare. The service conductors are rarely the highest conducting object, with the distribution primary (and it's conductors already surrounded by a stronger electrical field) always several feet higher, and the structure of the premise itself often extending at least several feet higher than the attachment point. Lightning follows the path of least resistance (literally), so anything able to conduct - trees, wet chimneys, metal gutters/downspouts, distribution primary – that is higher or more easily struck than the service conductors is likely a more inviting target.

Lightning strike on the premise wiring.
In this scenario the whole house SPD offers very little to absolutely no protection. What a whole-house SPD does is clamp the voltage at the point it is connected to a circuit. Circuits are made of conductors, and conductors have a resistance per unit distance. Simple Ohm's law calculation. If a circuit is 50 ft long with the main panel and Type-I or Type-II SPD at one end and lightning strikes the other, the voltage profile across the length of those circuit conductors can be as simple as the linear Ohm's law calculation based on Ohms / ft from either end. If the lightning carries enough energy to raise the point of entry to 10 kV, then 25 ft from either end you could expect to see 5 kV, assuming no breaching of the insulation to other conductive paths. This scenario almost always results in damage to both utilization equipment and premise wiring, and the only type of SPD that offers any sort of protection at all would be SPD devices of a high enough joule rating built into the connected equipment, or possibly those located at the point where the equipment connects to the premise wiring.

Lightning strike near to, but not directly on, the premise wiring.
This scenario is the hardest to predict, as it involves induction and the antenna effect. It is a true wildcard in how it can affect wiring systems.

When lightning strikes it creates a current path, and anywhere you have current flow you have an electro-magnetic (EM) field. In the case where the current flow occurs in high-intensity but very narrow pulses you have a very strong, very rapidly changing EM field. Conductors exposed to changing EM fields develop induced currents in them. This is where a bit of antenna theory comes into play.

The orientation of the conducting path of the lightning strike determines the orientation of the changing EM field. Wires parallel to that path can see the greatest induction effect, while wires oriented perpendicular to the lightning's path may see zero induced current at all. Add to that the 'frequency' of the lightning strike, both in the width of the transient pulses (most lightning is comprised of several strikes in close succession), and the spacing between those pulses. This 'frequency' forms a tuned, radiated pulse that acts almost like a radio wave. Over in the radio world, antennas are tuned to certain frequencies based in part on the length of their primary conducting element. ¼-wave, ½-wave, and full-wave antennas are the most common, with the full-wave being the most sensitive of the three for reception. (It has the greatest length exposed to the EM field, and has the most side-lobes in its antenna pattern.)

A section of premise wiring running roughly parallel to the path of a lightning strike perform much like a receiving antenna. If the length of the circuit conductor in the roughly parallel orientation happens to be of a length close to ¼, ½, or 1 full wavelength to the 'frequencies' present in the EM waveform of the lightning strike, those conductors can experience a significant induced voltage and current. In addition, the voltage waveform across an antenna (and in any resonant circuit) will experience peaks and nulls. So will house wiring under the induced effects of a nearby lightning strike. This means that the SPD may be at a null point and see nothing of the transient, meanwhile the big-screen TV is toast. You can have three appliances plugged into three successive outlets on the same circuit and only one will be damaged. Or maybe only one survives and the other two are damaged. Where this effect is at its greatest is on circuits where there are numerous switches in the 'off' position. The neutral conductor is continuous and its full length may be exposed to the EM wave. With switches breaking off sections of the hot leg, the amount of exposure can be much less. This has the effect of inducing a much greater amount of energy into the neutral than is induced into the hot leg and essentially driving a voltage difference between the conductors where the equipment is connected. This difference can be additive or subtractive. If additive it can easily do damage.

As for whole-house SPDs, the peaks and nulls and antenna effect of house wiring under this scenario is something they likely will not protect at all against. Again, only SPD devices at the point of equipment connection to the premise wiring, or surge protection built into the equipment itself, will provide any reasonable protection in this situation.

The fourth reason is that whole house SPDs provide a false sense of security, and are rated using a meaningless and confusing manner.
As illustrated in multiple of the preceding scenarios, Type-I and Type-II SPDs are not capable of providing adequate protection to utilization equipment connected to the premise wiring system. Yet when the typical consumer hears “whole-house surge protection” they will automatically equate that to complete protection for everything in the house against all situations, when this is simply not the case. Unless it is made clear that these devices are only one layer of a multi-layered protection approach, the typical consumer will continue to experience losses even after being required to add a device whose marketing implies total protection.

Further to that is the rating system commonly used for Type-I and Type-II SPDs. These devices are most often rated in their ability to handle a certain value of kA. For example, ‘10 kA surges’, or ‘up to 40kA surges’. While these big numbers can seem impressive to the uninformed, they are essentially meaningless for determining the actual capability of the device. It is, as mentioned earlier, the ability to absorb and process a certain level of total energy that determines the usefulness of the device. A 10 kA transient of 1 uSec carries with it a lot less energy than a 10 kA transient of 1 mSec. That is why the Joule rating is much more meaningful. The Joule incorporates both the current and the time it is present, providing a measure of the total energy processed. The average consumer, having been exposed to the Joule ratings typically used for Type-III SPDs, has a basic understanding of what that means, and when presented with a similar device, a surge protector, with a kA rating would likely equate the numbers to what they know. In other words they would equate 10 kA = 10,000 A protection to 10 kJ = 10,000 Joule protection, which would be incorrect.

A final note toward the false sense of security point, most whole-house SPDs provide an indicator light to alert of the protection status. So do Type-III (power-strip) SPDs. These indicators allow a person to see if the surge protection is still active for a SPD that does not trip a circuit off or shut off the power to connected equipment when it fails. Type-I and Type-II SPDs are typically located in out-of-the-way (as in out of sight, out of mind) locations of a premise. Type-III power strips are usually behind shelves, under desks, behind entertainment centers, or behind the equipment they serve, where they typically cannot be seen. As a result, it is rare for consumers to pay attention to these indicator lights or understand what they mean even when they can and do see them. In the vast majority of cases the protection can end without the consumer ever realizing that they are no longer protected.

To summarize, the electric utility industry encourages the continued availability of Type-I and Type-II ‘whole-house’ SPDs as an option for those seeking a basic level of protection for their utilization equipment, but believes that they should not be required by NFPA 70 for the aforementioned reasons.

Thank you.

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Committee:	NEC-P10

Committee Statement

Resolution: The requirement for surge protection in the NEC is necessary to provide protection for sensitive electronics for safety devices in the home.

Public Input No. 4415-NFPA 70-2023 [Section No. 230.67]

230.67 Surge Protection, 1000 Volts or Less .

(A) Surge-Protective Device.

All services supplying the following occupancies shall be provided with a listed surge-protective device (SPD):

(1) Dwelling units

(2) Dormitory units

(3) Guest rooms and guest suites of hotels and motels

(4) Areas of nursing homes and limited-care facilities used exclusively as patient sleeping rooms

Informational Note: See 517.10(B)(2).

(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 at the service equipment as required in 230.67(B) if located at each next level distribution equipment downstream toward the load. Surge Protection installed for services as described in this exception does not replace the requirement to install surge protection on feeders and branch circuits where required elswhere in this code.

(C) Type.

The SPD shall be a Type 1 or Type 2 SPD.

(D) Replacement.

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

(E) Ratings.

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

Statement of Problem and Substantiation for Public Input

The surge protective device is required to be installed by 230.67(A), but the user must refer to Article 242 to find the requirement that the installed device be listed if it is 1000 volts or less. Other equipment and devices required in Chapter 2 such as ground-fault circuit-interrupters, arc-fault circuit interrupters, and wall-mounted control devices for required lighting outlets state listing requirements in the section that states the equipment or device is required to be installed. This change would fit with the style of other requirements and allow the user to readily know that listing is a requirement for the installed SPD.

There is also a problem with this requirement if the service equipment is over 1000 volts but not over 1500 volts dc nominal. This equipment is now covered by the scope of Article 230 and 230.67(A) requires a surge protective device (SPD). However, Part III of Article 242 refers to the overvoltage protection for over 1000 volts as a Surge Arrester. Changing the Title of 230.67 would solve this discrepancy. If it is determined that there is a requirement to install surge protection for services over 1000 volts but not over 1500 volts dc nominal, it also would be necessary to add a new first level subdivision for surge protection over 1000 volts but not over 1500 volts dc nominal because the existing 230.67(B), 230.67(C), and 230.67(E) also refer to the SPD.

Lastly, the requirement for surge protection on services could be interpreted to mean that it supersedes the requirement to have additional surge protection on feeders or branch circuits downstream from the service. The wording of the exception to 230.67(B) especially makes it unclear that protection is required on both services and feeders. Adding a statement to clarify the requirement and the exception will eliminate the ability to misinterpret the requirement.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 4395-NFPA 70-2023 [Section No. 225.42]	Similar requirement in different article and needs similar revision

Public Input No. 4404-NFPA 70-2023 [Section No. 215.18]	Similar requirement in different article and needs similar revision
Public Input No. 4404-NFPA 70-2023 [Section No. 215.18]	

Submitter Information Verification

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Submittal Date:	Thu Sep 07 14:45:59 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: The proposed title revision is already addressed in the scope of the article. The requirement for listing is already addressed in Article 242. The proposed language is adding unnecessary redundancy as the language in 230 addresses services and the language in 215 and 225 addresses feeder and branch circuit locations.

Public Input No. 46-NFPA 70-2023 [Section No. 230.67]

230.67 Surge Protection.

(A) Surge-Protective Device.

All services supplying the following occupancies shall be provided with a surge-protective device (SPD):

(1) Dwelling units

(2) Dormitory units

(3) Guest rooms and guest suites of hotels and motels

(4) Areas of nursing homes and limited-care facilities used exclusively as patient sleeping rooms

Informational Note: See 517.10(B)(2) and 210 . 12(D)(2) .

(B) Location.

~~The SPD shall be~~ Type 2 SPDs shall be connected on the load side of the service disconnect overcurrent device required by 230.91, unless installed in accordance by 230.82(B), and shall be an integral part of the service equipment or shall be located immediately adjacent thereto.

Exception No. 1 : ~~The SPD~~ SPDs shall not be required to be located at the service equipment ~~as required in 230.67(B)~~ if located at each next- level distribution equipment ~~downstream~~ toward the ~~load.~~ loads.

Exception No. 2: In lieu of required Type 2 SPDs, Type 1 SPDs shall be permitted to be connected on the supply side of the service disconnect overcurrent device and shall be an integral part of the service equipment or shall be located immediately adjacent thereto.

(C) – **SPD Type** .

The SPD shall be a Type ~~1 or~~ 2 SPD. A listed Type 1 SPD shall be permitted to be installed in lieu of a required Type 2 SPD.

(D) Replacement.

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

~~**(E)** Ratings.~~

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

Statement of Problem and Substantiation for Public Input

SUMMARY:
• These changes are needed for correlation. 2020 NEC® 90.1(B) / 2023 NEC® 90.2(B) "Adequacy": "This Code contains provisions that are CONSIDERED NECESSARY for SAFETY. ..." SPD Type 2 protection is the ESSENTIAL MANDATE to assure that protective electronic devices "such as fire alarm systems, IDCIs, GFCIs, AFCIs and smoke alarms" remain effective. In contrast, an SPD Type 1 protective device is designed for this circuit location as merely a PERMISSIVE ALTERNATIVE that goes beyond what's "considered necessary". Express it that way PERMISSIVELY! To clarify further, when Type 1 SPDs are installed in an SPD Type 1 (ARRESTOR) LOCATION, they are nowhere near this sensitive equipment to be protected.

• Again, these changes are needed for correlation. 2020 NEC® 90.1(A) / 2023 NEC® 90.2(A) cover "Practical Safeguarding": "... This Code is NOT intended as a DESIGN SPECIFICATION ..." nor is it to be used as a DESIGN SPECIFICATION MANDATE. Nominal discharge current rating is a performance specification, not a safety requirement, and must be left to the design specification!

• 2023 NEC® new 242.9 "Indicating" and published UL Standard UL 1449 already adequately require ACTUAL SPD STATUS INDICATION of CONTINUING FUNCTIONALITY of SPDs. Therefore, 2023 NEC® new 230.67(E) is poorly redundant to that end. The nominal discharge current DESIGN SPECIFICATION attempts to predict approximately the ENDURANCE LONGEVITY of the SPD and must NOT be used as a PREDICTIVE proxy for SPD CONTINUING FUNCTIONALITY better addressed by ACTUAL INDICATORS required elsewhere in the Code and in the product standard.

• Absolutely NO DATA whatsoever was PRESENTED to substantiate that any safety issue exists for LISTED Type 2 SPDs having a nominal discharge current rating of 3 kA or 5 kA and that Type 2 SPDs so rated inherently cannot adequately and safely protect the intended protective equipment connected to the load side of the service overcurrent device. Fully capable LISTED Type 2 SPDs were unnecessarily excluded by 2023 NEC® 230.67(E), with no technical basis.

SPECIFICS:
• 230.67(B): The connection location mandate (versus permissive connection location) is not appropriately correlated with NEC® 242.14, in violation of 2020 NEC® 90.1(B) / 2023 NEC® 90.2(B) "Adequacy". Type 2 SPDs connect at and protect the LOAD SIDE of the service disconnect OVERCURRENT DEVICE required in 230.91 or of subsequent feeder's first OVERCURRENT DEVICE. Type 1 SPDs per NEC® 242.13 connect at the SUPPLY SIDE of the service disconnect means as permitted in 230.82(4), or connect in accordance with NEC® 242.14.

• 2020 NEC® 230.67 was proposed by Public Input PI-2696-NFPA70-2017 [James Dollard for IBEW]. The intent of that Public Input is to assure that protective electronic devices "such as fire alarm systems, IDCIs, GFCIs. AFCIs and smoke alarms" would not be rendered ineffective due to transient overvoltage damage. As improperly worded in 230.67(C) by FR-8546-NFPA70-2018, the clarity of EXACTLY WHAT was being surge protected became unclear. The equipment to be surge protected is on the LOAD SIDE. There are no "fire alarm systems, IDCIs, GFCIs, AFCIs and smoke alarms" types of equipment installed on the SUPPLY SIDE. This information appears to have been omitted in the Substantiation of Public Input PI-2696-NFPA70-2017. This added 230.67 requirement should have MANDATED SPD Type 2, with PERMISSIVE use of an SPD Type 1 in the service equipment as an allowed alternative. The NEC® sets essential installation requirements to be based upon safety metrics. Performance mandates with no rationale should never be allowed. The new 230.67(E) performance requirement to include nominal discharge current for an SPD is a performance specification, not a safety requirement nor a safety measurement. These nominal discharge current parameters must be left to the design specifications and engineering, in compliance with NEC® 2020 90.1(B) / 2023 NEC® 90.2(B) "Adequacy" for ESSENTIAL safety requirements versus OPTIONAL design specifications.

• 230.67(B): CONNECTION LOCATION (in the circuit) is a distinct consideration from PHYSICAL ENCLOSURE-MOUNTING LOCATION. The revised wording was harmonized with appropriate wording from 242.14(A), i.e., "... connected anywhere on the load side of a service disconnect overcurrent device required in 230.91 unless installed in accordance with 230.82(8)".

• 2023 NEC® 230.67(E): Nominal discharge current rating is purely a performance specification, NOT a safety requirement, and should be left to the design specification, in compliance with 2020 NEC® 90.1(A) / 2023 NEC® 90.2(A).

• 2023 NEC® 230.67(E): Public Input PI-3722-NFPA70-2020 [Garret Wernecke of Raycap Inc.] and resulting FR-8299-NFPA70-2020 wrongly conflated that the SPD specified in 2020 NEC® 230.67 served to protect the SUPPLY SIDE of the service equipment and consequently mandated the lowest value of nominal discharge current rating I(n) [cap-eye-sub-n] permitted to be UL 1449-listed for a Type 1 SPD of 10 kA. Rather than to assure those protective electronic devices on the LOAD SIDE of the service disconnect remained operational, the 230.67 mandate was directed at the LINE SIDE where these "fire alarm system, IDCI, GFCI, AFCI and smoke alarm" protective devices are NOT installed.

This 230.67(E) mandate ignored the entire purpose of an SPD from the UL Safety Standard UL 1449. A listed Type 2 SPDs CAN CONTINUE to have a nominal discharge current rating of a fully-listable 3 kA or 5 kA. This mandate misses the point of listed SPDs installed for generations that are still fully operational, with no reports of insufficient Nominal Discharge Current values.

• Absolutely no supporting data was provided for public review. To date, there is no technical data in support of Public Input PI-3722-NFPA70-2020 or First Revision FR-8299-NFPA70-2020, or with any subsequent Public Comments thereto. In order to create a safety mandate as a U. S. national mandate, substantiation of a safety issue MUST be demonstrated. Listed Type 2 SPDs, with nominal discharge current ratings of 3 kA or 5 kA, and protecting equipment on the load side of the service disconnect overcurrent device has been accepted in 2017 (and earlier) NEC® Article 285 and is still being used with no consequences. UL has stated that it has seen no safety issues that would warrant withdrawal of continued listing of Type 2 SPDs with nominal discharge ratings of 3 kA or 5 kA. To mandate this nominal discharge current rating now and further to raise the mandated rating, documentation must be provided to show cause. There has still been no case presented to impose this mandate and to increase its value. (Please note that a nominal discharge current rating of 10 kA has nothing whatsoever to do with the common Short-Circuit Current Rating [SCCR] or Interrupting Rating of COINCIDENTALLY a 10 kA VALUE.)

• The Nominal Discharge Current I(n) attribute is being misrepresented. Nominal discharge current rating I(n) [cap-eye-sub-n] is being used in an attempt to establish the ENDURANCE LONGEVITY of the SPD. This is incorrect, as normal power system events will fail an SPD, regardless of the I(n) rating. It should not be used as a proxy for SPD CONTINUING FUNCTIONALITY or to incite the belief that higher I(n) ratings provide improved protection. SPDs are always selected by VOLTAGE as their function is voltage-dependent.

• Per UL Standard UL 1449 and 2023 NEC® new 242.9 "Indicating", added by Public Input PI-3740-NFPA70-2020 [Rudolph Garza of IAEI] and FR-7957-NFPA70-2020, "an SPD shall provide INDICATION that it is FUNCTIONING PROPERLY".

• 230.67(B) Exception (No. 1) editorial: Less-precise "downstream" for the CONNECTION location is redundant to more-accurate "toward the load". Further, for NEC® language-translation reasons, a water flow analogy should not be used to avoid reader confusion in other language NEC® editions; in general the PROTECTION by SPDs is diadromous, not catadromous.

• 230.67(B) Exception (No. 1) editorial: The words "as required in 230.67(B)" are unnecessary and indeed confusing because this Exception already resides in 230.67(B).

• I serve on what is now the CSA Technical Subcommittee/Integrated Working Group for CSA-C22.2 No. 269-series CSA Standards for Surge Protective Devices from the 1990s to present, and have been involved in the product engineering of surge protective devices from the late 1970s to present through two employers (General Electric Company and Hubbell Incorporated).

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 58-NFPA 70-2023 [Section No. 225.42]	230.67 is the basis for 225.42 and 215.18 existing.
Public Input No. 75-NFPA 70-2023 [Section No. 215.18]	230.67 is the basis for 225.42 and 215.18 existing.
Public Input No. 58-NFPA 70-2023 [Section No. 225.42]	
Public Input No. 75-NFPA 70-2023 [Section No. 215.18]	

Submitter Information Verification

Submitter Full Name:	Brian Rock
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Submittal Date:	Thu Jan 05 12:38:01 EST 2023
Committee:	NEC-P10

Committee Statement

Resolution: The language in (B) and (C) is correct as written. The need for an SP to have an In Rating of 10kA or more is to ensure the SPD is sufficiently robust to continue providing protection for the safety equipment it is protecting. Services could provide more opportunity for surge events because they are exposed to natural environmental events.

Public Input No. 805-NFPA 70-2023 [Section No. 230.67(A)]

(A) Surge-Protective Device.

All services supplying the following occupancies shall be provided with a surge-protective device (SPD):

(1) Dwelling units

(2) ~~Dormitory units~~ Dormitories

(3) Guest rooms and guest suites of hotels, motels, and ~~motels~~ dormitories

(4) Areas of nursing homes and limited-care facilities used exclusively as patient sleeping rooms

Informational Note: See 517.10(B)(2).

Statement of Problem and Substantiation for Public Input

OBJECTIVE:
• USABILITY of NEC® and consistent CORRELATION with the defined term's EXTRACTION source NFPA 101® Life Safety Code® regarding INDIVIDUAL guest rooms and individual guest suites of dormitories versus the ENTIRE dormitory occupancy. NEC® Correlation Committee [NEC-AAC] take note.

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BACKGROUND: Users of NEC® have encountered interpretational discrepancies with the present confusing wording. Presently, interpretation confusion exists to readers of NEC® regarding the use of the term "dormitory UNIT" versus the present definition's ambiguous clause " ... group SLEEPING ACCOMMODATIONS are provided for more than 16 persons who are not members of the same family IN ONE ROOM, OR A SERIES OF CLOSELY ASSOCIATED ROOMS, ...". Because of misinterpretation, it has been interpreted by some AHJs that the "UNIT" itself MUST accommodate "MORE THAN 16 PERSONS".

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The phrase "IN ONE ROOM, OR A SERIES OF CLOSELY ASSOCIATED ROOMS" refers to "who are NOT MEMBERS of the SAME FAMILY", and does NOT refer to the "group SLEEPING ACCOMMODATIONS" having to be within in ONE room or ONE suite of rooms. Consequently, "dormitory" refers to the ENTIRE building or the ENTIRE space within that building AS AN OCCUPANCY that must accommodate MORE THAN 16 persons, and NOT to EACH specific sleeping room accommodating more than 16 persons.

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Misuse of the term "dormitory UNIT" has effectively DIMINISHED SAFETY for what are colloquially called "dormitory rooms" that are now wrongly NOT treated as guest rooms or guest suites WITHIN a DORMITORY OCCUPANY. These so-called dormitory UNITS (INDIVIDUAL ROOMS) are being misinterpreted such that intended GFCI, AFCI and other protection requirements do NOT APPLY for DORMITORY bedrooms, for DORMITORY living rooms, and for closets and hallways INSIDE the so-called dormitory UNIT if that "UNIT" accommodates FEWER THAN 17 OCCUPANTS.

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NFPA 101® Informational Annex A has long ago addressed this misinterpretation: "A.3.3.68 Dormitory. Rooms within dormitories intended for the use of individuals for combined living and sleeping purposes are guest rooms or guest suites. Examples of dormitories are college dormitories, fraternity and sorority houses, and military barracks.". Further, "Guest Room" and "Guest Suite" are ALREADY explicitly defined terms in both NFPA 70® and NFPA 101 [3.3.136 for "Guest Room"; 3.3.285.1 for "Guest Suite"].

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It is essential therefore that the terminology and usage for dormitories and for guest rooms and guest suites of dormitories in NFPA 70® be clarified at this time, CONSISTENT with NFPA 101, to avoid enforcement confusion between Codes.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 798-NFPA 70-2023 [Definition: Dormitory Unit.]	Clarification of NEC ambiguity in the definition extracted from NFPA 101
Public Input No. 798-NFPA 70-2023 [Definition: Dormitory Unit.]	

Submitter Information Verification

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Submittal Date: Fri May 12 17:34:07 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9142-NFPA 70-2024

Statement: The language is revised to coordinate with the proposed revised definition for Dormitory which is found in NFPA 101. The Correlating Committee will need to review the decisions made on the revisions proposed for the definition of Dormitory. The informational note under 230.67(A) has been deleted for compliance with section 2.1.10 of the NEC Style Manual. Added a new item (5) to align with other proposed action taken in Articles 215 and 225.

Public Input No. 2021-NFPA 70-2023 [Section No. 230.70(A)]

(A)~~–~~ **Service Disconnect** Location.

The service disconnecting means shall be installed in accordance with 230.70(A)(1), (A)(2), ~~and~~ (A)(3), and (A)(4) .

(1)~~–~~ ~~Readily Accessible Location~~ One- and two-family dwellings .

The service disconnecting means shall be installed at a readily accessible location on the exterior of the building.

(2) Other than one- and two-family dwelling units.

The service disconnecting means shall be installed at a readily accessible location either outside of a building or structure or inside nearest the point of entrance of the service conductors.

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3) Bathrooms.

Service disconnecting means shall not be installed in bathrooms.

(~~3~~ 4) Remote Control.

Where a remote control device(s) is used to actuate the service disconnecting means, the service disconnecting means shall be located in accordance with 230.70(A)(1).

Statement of Problem and Substantiation for Public Input

This public input is being submitted on behalf of the Minnesota Department of Labor and Industry. Currently, the Department's inspection staff includes 14-office/field staff, 12-state field inspectors, 2-virtual inspectors and 50 plus contract electrical inspectors that complete over 170,000 electrical inspections annually.

This is a companion PI that supports the deletion of 230.85. Please see substantiation provided for 230.85.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 1925-NFPA 70-2023 [Sections 230.85, 230.85]	Proposed deleted 230.85 with substantiation.
Public Input No. 2022-NFPA 70-2023 [Section No. 230.70(B)]	Relocated from 230.85.
Public Input No. 2023-NFPA 70-2023 [Section No. 230.70(C)]	Relocated from 230.85.
Public Input No. 1925-NFPA 70-2023 [Sections 230.85, 230.85]	
Public Input No. 2023-NFPA 70-2023 [Section No. 230.70(C)]	
Public Input No. 2024-NFPA 70-2023 [Section No. 225.41(A)(1)]	

Submitter Information Verification

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Submittal Date: Fri Aug 11 08:46:57 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: FR-9155-NFPA 70-2024

Statement: Requirements related to emergency disconnects found in Section 230.85 of the NEC have caused confusion for the electrical industry since it was not clear what specific types of disconnects were allowed to meet the requirements. It was also unclear how to ensure the emergency disconnect equipment is protected from available fault current. In addition, there has been confusion when applying the requirements for grounding and bonding of Article 250 when an emergency disconnect is installed on the supply-side of a service disconnecting means. This First Revision in conjunction with other First Revisions to 230.82 and 230.85, do not delete requirements for emergency disconnects for one-and two family dwellings, rather the requirements are greatly simplified by requiring the service disconnecting means for the dwelling to be located at a readily accessible location on the outside of the dwelling. Such service disconnecting means will also serve as the emergency disconnect for one-and- two family dwellings. This change will resolve issues related to what type of equipment can be installed for the emergency disconnect, how grounding and bonding is required to be installed, and the issues related to available fault current are addressed by the fact that service equipment is required to have appropriate overcurrent protection.

The concerns of the submitter for Public Input 2191 have been addressed with the First Revision of 230.70. The specific marking is added to better align with the requirement in 230.70(B)(2).

Concerning Public Input 2512, removing the existing requirement does not change the requirements already specified in the NEC. Such existing text is unnecessary. The second sentence is retained as it’s considered to provide clarity.

Public Input No. 2582-NFPA 70-2023 [Section No. 230.70(A)(1)]

(1) Readily Accessible Location.

The service disconnecting means shall be installed at a readily accessible location either outside of a building or structure or inside nearest the point of entrance of the service conductors. For one- and two-family dwellings, the service disconnecting means shall be located at a readily accessible location on the outside of the dwelling.

Exception: For existing installations where only meter sockets, service entrance conductors, or related raceways and fitting are replaced, service disconnecting means for one- and two-family dwellings shall not be required to be readily accessible on the outside of the dwelling.

Statement of Problem and Substantiation for Public Input

This PI is being submitted in conjunction with other PI's with the intent to require service disconnect(s) for one- and two-family dwellings to be located at a readily accessible location on the outside of the dwelling so the requirements of 230.85 can simply be deleted. The requirements of 230.85 regarding emergency disconnects for dwellings have become lengthy, complicated, and confusing. The issue becomes even more complicated when trying to address the grounding and bonding requirements of Article 250 when dealing with a disconnect located on the supply side of the service disconnect. The whole concept regarding a readily accessible emergency disconnect on the outside of the dwelling would be greatly simplified if the main service disconnect(s) for the dwelling were to simply be required on the outside of the dwelling. By doing so there would always be a readily accessible disconnect for first responders, and there would not be a need for all the excessive clarifications and additional requirements currently found in Section 230.85. NFPA is on a mission to make the NEC more user-friendly and this, and the associated proposed PI's, help with this goal in mind and removes more than half a page of unnecessary requirements.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2584-NFPA 70-2023 [Section No. 230.82]	
Public Input No. 2583-NFPA 70-2023 [Section No. 230.85]	
Public Input No. 2583-NFPA 70-2023 [Section No. 230.85]	
Public Input No. 2584-NFPA 70-2023 [Section No. 230.82]	

Submitter Information Verification

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Submittal Date: Tue Aug 22 22:39:35 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: FR-9155-NFPA 70-2024

Statement: Requirements related to emergency disconnects found in Section 230.85 of the NEC have caused confusion for the electrical industry since it was not clear what specific types of disconnects were allowed to meet the requirements. It was also unclear how to ensure the emergency disconnect equipment is protected from available fault current. In addition, there has been confusion when applying the requirements for grounding and bonding of Article 250 when an emergency disconnect is installed on the supply-side of a service disconnecting means. This First Revision in conjunction with other First Revisions to 230.82 and 230.85, do not delete requirements for emergency disconnects for one-and two family dwellings, rather the requirements are greatly simplified by requiring the service disconnecting means for the dwelling to be located at a readily accessible location on the outside of the dwelling. Such service disconnecting means will also serve as the emergency disconnect for one-and- two family dwellings. This change will resolve issues related to what type of equipment can be installed for the emergency disconnect, how grounding and bonding is required to be installed, and the issues related to available fault current are addressed by the fact that service equipment is required to have appropriate overcurrent protection.

The concerns of the submitter for Public Input 2191 have been addressed with the First Revision of 230.70. The specific marking is added to better align with the requirement in 230.70(B)(2).

Concerning Public Input 2512, removing the existing requirement does not change the requirements already specified in the NEC. Such existing text is unnecessary. The second sentence is retained as it’s considered to provide clarity.

Public Input No. 512-NFPA 70-2023 [Section No. 230.70(A)(1)]

(1) Readily Accessible Location.

The service disconnecting means shall be installed at a readily accessible location either outside of a building or structure or inside nearest the point of entrance of the service conductors. Service disconnecting means shall be installed in accordance with 404.08.

Statement of Problem and Substantiation for Public Input

Article 100 Definition is vague for Readily Accessible and further clarification on maximum mounting height should be incorporated in article 230.70. Article 230.70 is lacking the proper maximum mounting height and should reference to article 404.08. Providing this cross-reference will provide much needed clarification on acceptable maximum mounting height.

Main problem, on installations where a remote control is being used to disconnect the electrical service to the facility. There is no reference to a maximum mounting height for service disconnects, resulting in inconsistent installations.

Submitter Information Verification

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Submittal Date: Mon Mar 27 10:37:12 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The proposed change is unnecessary since maximum mounting heights of disconnect equipment are already addressed per 240.24(A) - which references maximum mounting heights of circuit breakers and switches containing fuses. Additionally, Chapters 1-4 apply generally throughout the code and as such the requirements for 404.8 would be applicable to service disconnects. The proposed changes would not apply to remote control device(s) as those are not the service disconnects.

Public Input No. 2022-NFPA 70-2023 [Section No. 230.70(B)]

(B) Marking.

Each service disconnect shall be permanently marked to identify it as a service disconnect. The service disconnect required in (A)(1) shall be marked as follows:

EMERGENCY DISCONNECT, SERVICE DISCONNECT

Marking shall comply with 110.21(B) and both the following:

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

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

Statement of Problem and Substantiation for Public Input

This public input is being submitted on behalf of the Minnesota Department of Labor and Industry. Currently, the Department's inspection staff includes 14-office/field staff, 12-state field inspectors, 2-virtual inspectors and 50 plus contract electrical inspectors that complete over 170,000 electrical inspections annually.

This is a companion PI in support of the deleted 230.85.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 1925-NFPA 70-2023 [Sections 230.85, 230.85]	Marking requirements moved from 230.85.
Public Input No. 1925-NFPA 70-2023 [Sections 230.85, 230.85]	
Public Input No. 2021-NFPA 70-2023 [Section No. 230.70(A)]	
Public Input No. 2023-NFPA 70-2023 [Section No. 230.70(C)]	

Submitter Information Verification

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Submittal Date:	Fri Aug 11 09:09:51 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: FR-9155-NFPA 70-2024

Statement: Requirements related to emergency disconnects found in Section 230.85 of the NEC have caused confusion for the electrical industry since it was not clear what specific types of disconnects were allowed to meet the requirements. It was also unclear how to ensure the emergency disconnect equipment is protected from available fault current. In addition, there has been confusion when applying the requirements for grounding and bonding of Article 250 when an emergency disconnect is installed on the supply-side of a service disconnecting means. This First Revision in conjunction with other First Revisions to 230.82 and 230.85, do not delete requirements for emergency disconnects for one-and two family dwellings, rather the requirements are greatly simplified by requiring the service disconnecting means for the dwelling to be located at a readily accessible location on the outside of the dwelling. Such service disconnecting means will also serve as the emergency disconnect for one-and- two family dwellings. This change will resolve issues related to what type of equipment can be installed for the emergency disconnect, how grounding and bonding is required to be installed, and the issues related to available fault current are addressed by the fact that service equipment is required to have appropriate overcurrent protection.

The concerns of the submitter for Public Input 2191 have been addressed with the First Revision of 230.70. The specific marking is added to better align with the requirement in 230.70(B)(2).

Concerning Public Input 2512, removing the existing requirement does not change the requirements already specified in the NEC. Such existing text is unnecessary. The second sentence is retained as it’s considered to provide clarity.

Public Input No. 2191-NFPA 70-2023 [Section No. 230.70(B)]

(B) Marking.

Each service disconnect shall be permanently marked to identify it as a service disconnect. The marking shall include the words "SERVICE DISCONNECT" and shall meet the requirements of 110.21(B).

Statement of Problem and Substantiation for Public Input

Proposed text makes it clear as to exactly how to label a service disconnect. This language also matches the labeling requirements in 230.85(E)(1) for emergency service disconnects on one- and two-family dwellings.

Submitter Information Verification

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Committee:	NEC-P10

Committee Statement

Resolution: FR-9155-NFPA 70-2024

Statement: Requirements related to emergency disconnects found in Section 230.85 of the NEC have caused confusion for the electrical industry since it was not clear what specific types of disconnects were allowed to meet the requirements. It was also unclear how to ensure the emergency disconnect equipment is protected from available fault current. In addition, there has been confusion when applying the requirements for grounding and bonding of Article 250 when an emergency disconnect is installed on the supply-side of a service disconnecting means. This First Revision in conjunction with other First Revisions to 230.82 and 230.85, do not delete requirements for emergency disconnects for one-and two family dwellings, rather the requirements are greatly simplified by requiring the service disconnecting means for the dwelling to be located at a readily accessible location on the outside of the dwelling. Such service disconnecting means will also serve as the emergency disconnect for one- and- two family dwellings. This change will resolve issues related to what type of equipment can be installed for the emergency disconnect, how grounding and bonding is required to be installed, and the issues related to available fault current are addressed by the fact that service equipment is required to have appropriate overcurrent protection.

The concerns of the submitter for Public Input 2191 have been addressed with the First Revision of 230.70. The specific marking is added to better align with the requirement in 230.70(B)(2).

Concerning Public Input 2512, removing the existing requirement does not change the requirements already specified in the NEC. Such existing text is unnecessary. The second sentence is retained as it's considered to provide clarity.

Public Input No. 2023-NFPA 70-2023 [Section No. 230.70(C)]

(C) Suitable for Use.

Each service disconnecting means shall be suitable for the prevailing conditions. Service equipment installed in hazardous (classified) locations shall comply with the hazardous location requirements.

(D) Replacement.

Where the service disconnect is replaced in a one-and two-family dwelling, the requirements of this section shall apply.

Exception: Where only meter sockets, service entrance conductors, or related raceways and fittings are replaced, the requirements of this section shall apply.

Statement of Problem and Substantiation for Public Input

This public input is being submitted on behalf of the Minnesota Department of Labor and Industry. Currently, the Department's inspection staff includes 14-office/field staff, 12-state field inspectors, 2-virtual inspectors and 50 plus contract electrical inspectors that complete over 170,000 electrical inspections annually.

This is a companion PI in support of deleting section 230.85.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 1925-NFPA 70-2023 [Sections 230.85, 230.85]	deleted 230.85 with substantiation
Public Input No. 2021-NFPA 70-2023 [Section No. 230.70(A)]	Exterior service disconnect from 230.85
Public Input No. 2022-NFPA 70-2023 [Section No. 230.70(B)]	Marking requirements from 230.85
Public Input No. 1925-NFPA 70-2023 [Sections 230.85, 230.85]	
Public Input No. 2021-NFPA 70-2023 [Section No. 230.70(A)]	

Submitter Information Verification

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Submittal Date: Fri Aug 11 09:15:14 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: FR-9155-NFPA 70-2024

Statement: Requirements related to emergency disconnects found in Section 230.85 of the NEC have caused confusion for the electrical industry since it was not clear what specific types of disconnects were allowed to meet the requirements. It was also unclear how to ensure the emergency disconnect equipment is protected from available fault current. In addition, there has been confusion when applying the requirements for grounding and bonding of Article 250 when an emergency disconnect is installed on the supply-side of a service disconnecting means. This First Revision in conjunction with other First Revisions to 230.82 and 230.85, do not delete requirements for emergency disconnects for one-and two family dwellings, rather the requirements are greatly simplified by requiring the service disconnecting means for the dwelling to be located at a readily accessible location on the outside of the dwelling. Such service disconnecting means will also serve as the emergency disconnect for one-and- two family dwellings. This change will resolve issues related to what type of equipment can be installed for the emergency disconnect, how grounding and bonding is required to be installed, and the issues related to available fault current are addressed by the fact that service equipment is required to have appropriate overcurrent protection.

The concerns of the submitter for Public Input 2191 have been addressed with the First Revision of 230.70. The specific marking is added to better align with the requirement in 230.70(B)(2).

Concerning Public Input 2512, removing the existing requirement does not change the requirements already specified in the NEC. Such existing text is unnecessary. The second sentence is retained as it’s considered to provide clarity.

Public Input No. 2512-NFPA 70-2023 [Section No. 230.70(C)]

~~(C) Suitable for Use.~~

~~Each service disconnecting means shall be suitable for the prevailing conditions. Service equipment installed in hazardous (classified) locations shall comply with the hazardous location requirements.~~

Statement of Problem and Substantiation for Public Input

This is true of all equipment.

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City:	
State:	
Zip:	
Submittal Date:	Fri Aug 18 13:50:49 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: FR-9155-NFPA 70-2024

Statement: Requirements related to emergency disconnects found in Section 230.85 of the NEC have caused confusion for the electrical industry since it was not clear what specific types of disconnects were allowed to meet the requirements. It was also unclear how to ensure the emergency disconnect equipment is protected from available fault current. In addition, there has been confusion when applying the requirements for grounding and bonding of Article 250 when an emergency disconnect is installed on the supply-side of a service disconnecting means. This First Revision in conjunction with other First Revisions to 230.82 and 230.85, do not delete requirements for emergency disconnects for one-and two family dwellings, rather the requirements are greatly simplified by requiring the service disconnecting means for the dwelling to be located at a readily accessible location on the outside of the dwelling. Such service disconnecting means will also serve as the emergency disconnect for one-and- two family dwellings. This change will resolve issues related to what type of equipment can be installed for the emergency disconnect, how grounding and bonding is required to be installed, and the issues related to available fault current are addressed by the fact that service equipment is required to have appropriate overcurrent protection.

The concerns of the submitter for Public Input 2191 have been addressed with the First Revision of 230.70. The specific marking is added to better align with the requirement in 230.70(B)(2).

Concerning Public Input 2512, removing the existing requirement does not change the requirements already specified in the NEC. Such existing text is unnecessary. The second sentence is retained as it’s considered to provide clarity.

Public Input No. 2562-NFPA 70-2023 [Section No. 230.71]

230.71 Maximum Number of Service Disconnects.

Each service shall have only one ~~disconnecting means unless~~ service disconnect unless the requirements of 230.71(B) are met.

(A) General.

For the purpose of this section, ~~disconnecting means~~ disconnects installed as part of listed equipment and used solely for the following shall not be ~~considered a service disconnecting means: Power~~ counted as one of the permitted service disconnects:

(1) Disconnection of power monitoring equipment

(2) ~~Surge~~ Disconnection of surge -protective device(s)

(3) ~~Control~~ Disconnection of control circuit of ~~the ground~~ a ground -fault protection system

(4) ~~Power~~ Disconnection of control circuit for power -operable service ~~disconnecting means~~ disconnect

(B) Two to Six Service ~~Disconnecting Means~~ Disconnects .

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~~ disconnects shall be permitted to consist of a combination of any of the following:

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

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

(3) ~~Switchboard(s) where~~ Switchboards where there is only one service disconnect in each separate vertical section 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,~~ Switchgear and transfer switches ~~, or metering centers~~ where each service disconnect is located in a separate compartment

(5) Metering centers with ~~a main service disconnecting means in each metering center~~ each service disconnect located in a separate compartment or in separate enclosures

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

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~~ single service ~~disconnecting means in~~ disconnect in each enclosure include but are not limited to ~~motor~~ enclosed panelboards, motor control centers, fused disconnects, and circuit breaker enclosures.

Informational Note No. 3: Transfer switches ~~are provided~~ may be provided with one service disconnect ~~or~~ in the transfer switch enclosure, or multiple service disconnects in separate compartments within the transfer switch enclosure .

Statement of Problem and Substantiation for Public Input

This proposal addresses the following issues in 230.71:

- Revises text to maintain consistent terminology within the section, using the term "service disconnect" rather than “main service disconnect”, “service disconnecting means”, and “main service disconnecting means”.

- If a disconnect into which a service conductor terminates is considered a service disconnect, the statement in 230.71(A) is contradictory. Rather than saying these disconnects are not considered a service disconnect, the inconsistency would be better addressed by stating that these disconnects are not counted as one of the permitted service disconnects.
- The list items in (A) are reworded for clarity.
- List item 2 in (B) is a restatement of list item 1, for a particular product. “Enclosed panelboards” is added to Informational Note 2 to make clear that an enclosed panelboard is an example of separate enclosures with a single service disconnect.
- List item 3 in (B) is reworded to maintain consistent format with the other list items.
- List items 3 and 4 in (B) are revised to address “metering centers” in one place.
- The itemization of the list items in the exception is unnecessary, so it is removed.
- Additional clarifications are included for Informational Note No. 3.

Submitter Information Verification

Submitter Full Name: Robert Osborne
Organization: UL Solutions
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 22 07:24:41 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9167-NFPA 70-2024

Statement: The revised text aligns terminology to improve the clarity in the Section.

Informational Note No. 1 is being updated with the current edition of UL 67 in accordance with Section 3.3.6.2 of the Regulations Governing the Development of NFPA Standards.

Public Input No. 3166-NFPA 70-2023 [Section No. 230.71(A)]

(A) General.

For the purpose of this section, disconnecting means installed as part of listed equipment and used solely for the following shall not be considered a service disconnecting means:

(1) Power monitoring equipment

(2) Surge-protective device(s)

(3) Control circuit of the ground-fault protection system

(4) Power-operable service disconnecting means

(5) Meter disconnect switches

(6) Meter-mounted transfer switches

(7) Interconnected power production source disconnecting means

(8) Emergency disconnects in accordance with 230.85(B)(2) and (B)(3)

Statement of Problem and Substantiation for Public Input

Added list items (5) through (8) to expand the list in 230.71(A) with items from 230.82. All these new items should not be considered a service disconnecting means and will bring clarity to Code users.

Submitter Information Verification

Submitter Full Name: Mike Holt

Organization: Mike Holt Enterprises Inc

Street Address:

City:

State:

Zip:

Submittal Date: Tue Aug 29 20:37:50 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: Interconnected power production source disconnection means may be a service disconnecting means per Article 705. Meter-mounted transfer switches and meter disconnect switches are installed ahead of the service equipment and not marked as service equipment. In conjunction with a separate proposed First Revision to 230.70, emergency disconnects are now service disconnects and would not be ahead of the service disconnect.

Public Input No. 585-NFPA 70-2023 [New Section after 230.71(B)]

PROPOSED CHANGE TO 230.71B:

Add new section (7) to 230.71B:

Service Disconnect(s) may occupy a common section in metering enclosures when both (a) and (b) are met.

(a) Service Disconnect(s) shall be permitted in a common section of metering enclosures where all busbars, conductors and surfaces with voltage potential are insulated _ so as to comply with 230.62A.

(b) Two through six Service Disconnect(s) may occupy a common section in metering enclosures when the common section contains only conductors that feed the individual Service Disconnect(s). No other busbars, conductors or surfaces with voltage potential shall be permitted in the common Service Disconnect section. Field installed conductors intended to be terminated to the load side of the Service Disconnect(s) shall be permitted.

Informational Note No. 1: Metering centers are addressed in UL 67, _ *Standard for Panelboards* . _ Metering enclosure as used above is an enclosure that contains 1 or more meters that feed 1 or more Service Disconnects. When the meter is removed, power to the Service Disconnect is interrupted.

Additional Proposed Changes

File Name	Description	Approved
NEC_230.71B_to_NFPA.pdf	NEC 230.71 B	

Statement of Problem and Substantiation for Public Input

Manufacturers and contractors have long relied on 2-6 service disconnects in a common enclosure to supply power to 2-6 type occupancies. NEC 230.71B (2020 edition) now prohibits these enclosures and would require multiple individual disconnects or a single main disconnect ahead of the occupancy service disconnects. This is not practical since additional wall space is often not present. Some utilities do not permit a single main ahead of unmetered conductors. The extra number of field required terminations will result in more termination failures. NEC 230. 62A already addressed the danger that 230.71 B intended to eliminate. 230.71 B is a good section to prevent accidental contact in switchboards but fails to acknowledge that it does not apply to smaller 2-6 disconnect enclosures.

Submitter Information Verification

Submitter Full Name:	Gabe Kaprelian
Organization:	[Gabe Kaprelian Electrical Contractor and IAEI Certified Electrical Inspector]
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Tue Apr 11 13:01:36 EDT 2023
Committee:	NEC-P10

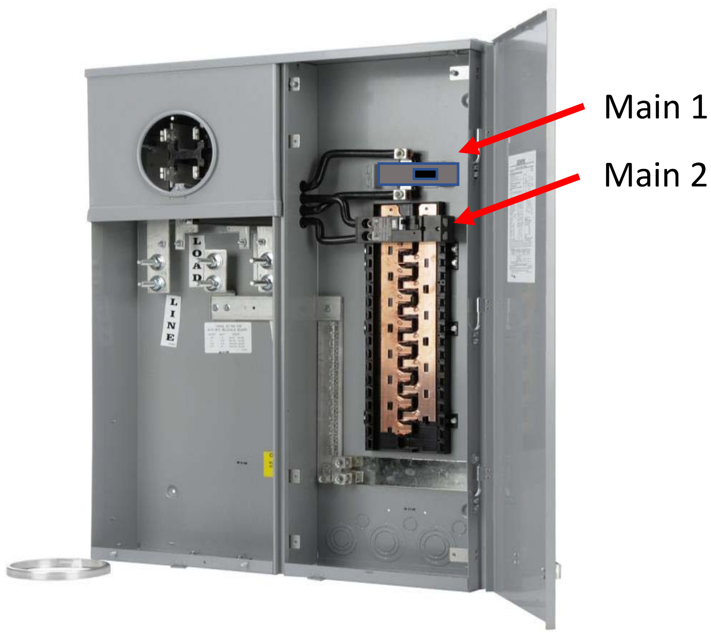
Committee Statement

Resolution: UL 67, Standard for Panelboards, covering these devices has been updated to require that each service disconnect be installed in a separate compartment per the 230.71(B) requirement. The requirement to install the additional service disconnects in separate compartments or enclosures would not necessarily change the number of field terminations. Additionally, no substantiation is provided on potential failures of field terminations.

Gabe Kaprelian Electrical Contractor
California License 321040
IAEI Certified Electrical Inspector 303800

Requesting change to NEC 230.71B

Utility Line side terminations and metering compartments are in separate barriered sections not accessible in the Service Disconnect sections.

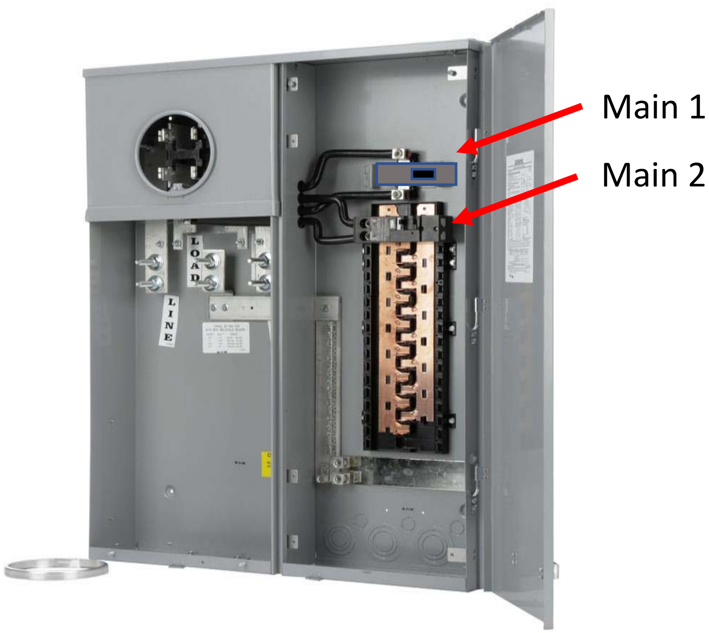


NEC 230.71B (2020 NEC) has eliminated the use of the attached metering enclosures. These enclosures have provided a safe and practical means for supplying single family dwellings, multi-family dwellings and other occupancies up to six meters.

Implementation of 230.71B will create unnecessary enclosures and numerous termination points that could result in more termination failures if six separate enclosures are required.

Many utilities do not permit a single main disconnect ahead of unmetered conductors as 230.71B (2) permits.

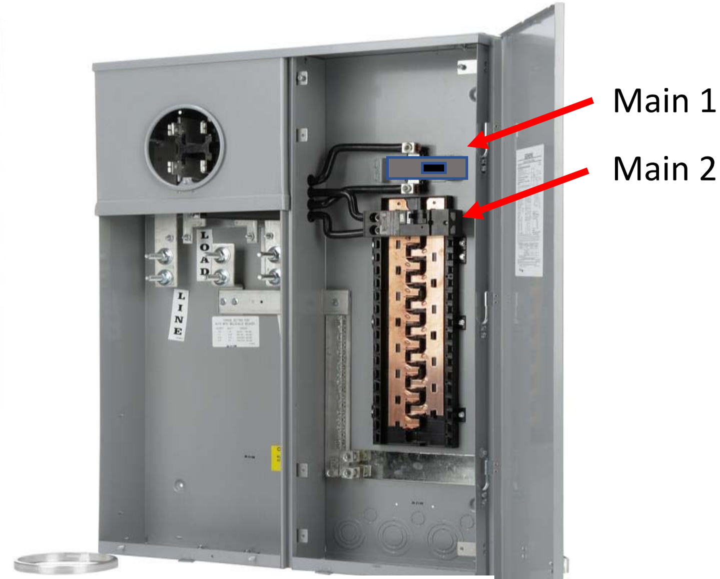
Utility Line side terminations and metering compartments are in separate barriered sections not accessible in the Service Disconnect sections.



These enclosures when built to comply with NEC 230.62 A are safe. With no live parts in the Service Disconnect(s) enclosure, the intent of making these enclosures more safe has already been met.

Note that only insulated conductors that feed each individual Service Disconnect are present in the Service Disconnect(s) section. There is NO live bussing present as is the case in 6-disconnect switchboard where energized horizontal and vertical cross bussing is present.

The intent of 230.71 B has merit in switchboard construction but not in the types of enclosures shown here.



Utility Line side terminations and metering compartments are in separate barriered sections not accessible in the Service Disconnect sections.

PROPOSED CHANGE TO 230.71B:

Add new section (7) to 230.71B:

Service Disconnect(s) may occupy a common section in metering enclosures when both (a) and (b) are met.
(a) Service Disconnect(s) shall be permitted in a common sction of metering enclosures where all busbars, conductors and surfaces with voltage potential are insulated so as to comply with 230.62A.
(b) Two through six Service Disconnect(s) may occupy a common section in metering enclosures when the common section contains only conductors that feed the individual Service Disconnect(s). No other busbars, conductors or surfaces with voltage potential shall be permitted in the common Service Disconnect section. Field installed conductors intended to be terminated to the load side of the Service Disconnect(s) shall be permitted.

Informational Note No. 1: Metering centers are addressed in UL 67, *Standard for Panelboards*. Metering enclosure as used above is an enclosure that contains 1 or more meters that feed 1 or more Service Disconnects. When the meter is removed, power to the Service Disconnect is interrupted.

Justification for the proposed change:

NEC 230.62B intends to promote a safer environment when multiple main disconnects are contained in a common section with live bussing that cannot be disconnected. The code making panel should be applauded for recognizing that this type of construction is dangerous, especially when load conductors must be installed past the live bussing. This has been a common design in SWITCHBOARD construction but does not apply to the types of enclosures shown in the previous pages.

230.71B (4) refers to metering centers but metering centers is not defined in Article 100. Switchboards may contain instrument meters or meters with current transformers. Current transformer meters DO NOT interrupt the current when removed.

The types of enclosures shown in the previous pages are unique and should not be subjected by the same requirements as switchboards or switchboards that contain meters.

When built to the already required standards imposed by 230.62A, these enclosures will ensure the safety of the qualified installer and provide a practical safe solution for electrifying 2-6 occupancies.

Public Input No. 1531-NFPA 70-2023 [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 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 ~~,~~ or transfer switches,~~ or metering centers where~~ where each disconnect is located in a separate compartment

(5) Metering centers with a main service disconnecting means in each metering center, or in a separate compartment of 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 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 are provided with one service disconnect or multiple service disconnects in separate compartments.

Statement of Problem and Substantiation for Public Input

This PI proposes to relocate the metering center requirements in list item (4) and place them with existing meter center requirements in list item (5). This will provide clarity to users of the Code by having all the requirements for metering centers in the same location, rather than the current confusing structure of two locations.

Submitter Information Verification

Submitter Full Name: Vincent Della Croce
Organization:
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jul 24 10:49:46 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9167-NFPA 70-2024

Statement: The revised text aligns terminology to improve the clarity in the Section.

Informational Note No. 1 is being updated with the current edition of UL 67 in accordance with Section 3.3.6.2 of the Regulations Governing the Development of NFPA Standards.

Public Input No. 2066-NFPA 70-2023 [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 enclosed panelboard ~~enclosure~~

(3) Switchboard(s) where there is only one service disconnect in each separate vertical section 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 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 are provided with one service disconnect or multiple service disconnects in separate compartments.

Statement of Problem and Substantiation for Public Input

The term ‘panelboard’ and ‘enclosed panelboard’ are defined terms. Adding the word ‘enclosed panelboard’ makes the text technically correct. Note: The term ‘Enclosed Panelboard’ was added to NEC Article 100 during the 2023 Code cycle.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Fri Aug 11 14:54:00 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: List item (2) is proposed to be deleted in a separate action.

Public Input No. 753-NFPA 70-2023 [Section No. 230.72(C)]

(C) Access to Occupants.

In a multiple-occupancy building, each occupant shall have access to the occupant's service disconnecting means.

Exception: In a multiple-occupancy building where electric service and electrical maintenance are provided by the building management and where these are under continuous building management supervision by personnel who are both physically on-site 24 hours every day including holidays and are also authorized to access the service disconnecting means , the service disconnecting means supplying more than one occupancy shall be permitted to be accessible to authorized management personnel only.

Statement of Problem and Substantiation for Public Input

Under the old wording, it makes no requirement whether the management be on-site or not. In the event of an electrical fire, it may take a few hours for off-site management staff to reach the multi-occupancy building when it is after business hours. On holidays, it may take until the next business day for them to arrive. Even fire-rated construction is normally only 3 hours. The old vague wording can leave for very unsafe interpretations by the authority having jurisdiction.

Even if during business hours, management staff may take an hour to arrive, especially with traffic jams. 1 hour is quite a long time in terms of building fires, especially with typical wooden construction. Under the new wording, it is explicit that at least 1 staff member who has authorized access to the service disconnecting means must physically be on site at any given moment including holidays and overnight. The housing or lodging complex need not have 24-hour front desk or doorman. It may simply be a single authorized staff member who lives there and is present at that moment while being off duty, only calling another authorized staff member when backup is needed.

Submitter Information Verification

Submitter Full Name: Conrad Ko

Organization: [Not Specified]

Street Address:

City:

State:

Zip:

Submittal Date: Sun Apr 30 01:48:48 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: This requirement would be unenforceable within NFPA 70.

Public Input No. 754-NFPA 70-2023 [Section No. 230.79]

230.79 Rating of Service Disconnecting Means.

The service disconnecting means shall have a rating not less than the calculated load to be carried, determined in accordance with Part III, IV, or V of Article 220, as applicable. In no case shall the rating be lower than specified in 230.79(A), (B), (C), or (D). The nominal line-to-ground voltage shall be no less than 120 volts. The nominal voltage shall be no less than 208 volts between the 2 sets of ungrounded conductors with the greatest potential difference.

(A) One-Circuit Installations.

For installations to supply only limited loads of a single branch circuit, the service disconnecting means shall have a rating of not less than 15 amperes.

(B) Two-Circuit Installations.

For installations consisting of not more than two 2-wire branch circuits, the service disconnecting means shall have a rating of not less than 30 amperes.

(C) One-Family Dwellings.

For a one-family dwelling, the service disconnecting means shall have a rating of not less than 100 amperes, 3-wire. There shall be at least 2 sets of ungrounded conductors.

(D) All Others.

For all other installations, the service disconnecting means shall have a rating of not less than 60 amperes. There shall be at least 2 sets of ungrounded conductors.

Statement of Problem and Substantiation for Public Input

Nowhere in the old Code did a minimum voltage be required for services. This leaves room for builders and power companies to make fun of and deprive customers of normal expectations of power supply capacity. That is because the old Code only specified the minimum ampere rating and conductor sizes, but power is voltage times current.

Theoretically, a power company that skimps as much as possible on distribution capacity (by conspiring with a builder) can meet the rest of the Code (other articles) by supplying the customer with just a 40-volt nominal service with the minimum required ampere rating with only 1 ungrounded conductor and 1 grounded conductor, only adding an unnecessary ground wire to satisfy the 3-wire requirement. The rest of the Code can be satisfied by just adding a transformer in the feeders to step it up to the required 120 volts for the branch circuits. This means that the power company could essentially cheat by limiting the power supply capacity to 1/5.2 of standard expectation of normal minimum (as long as it meets the service load calculations, and code does not require sufficient power capacity for large 240-volt appliances), because normal minimum is 208 volts nominal with three-phase, with most common minimum being 240 volts nominal with split-phase (a specific configuration of single-phase). 40 volts times 60 amperes gives a mere 2400 watts for the entire service. This means the client could not even install a single 240-volt large appliance.

Under the wording in the proposed Code change, it is explicit that the service for any unit must be at least 208 volts nominal at 60 amps, which gives a minimum reasonable capacity of 12,480 watts for a studio or 1-bedroom condo unit.

Submitter Information Verification

Submitter Full Name: Conrad Ko
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Sun Apr 30 02:17:09 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: No evidence of an issue has been provided. The specific section concerns the rating of the service disconnect only. This is outside the purview of NFPA 70.

Public Input No. 861-NFPA 70-2023 [Section No. 230.79(C)]

(C) One-Family Dwellings.

For a one-family dwelling, the service disconnecting means shall have a rating of not less than 100 amperes~~, 3-wire~~ .

Statement of Problem and Substantiation for Public Input

The number of wires doesn't establish (or change) the rating.

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Self-employed
Street Address:
City:
State:
Zip:
Submittal Date: Sun May 21 14:04:14 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9171-NFPA 70-2024

Statement: The text is revised to remove 3-wire as this is not a rating, and other wire configurations may also be suitable for one-family dwellings.

Public Input No. 2639-NFPA 70-2023 [Section No. 230.79 [Excluding any Sub-Sections]]

The service disconnecting means shall have a rating not less than the calculated load to be carried, determined in accordance with Article 220, Part III, IV, or V ~~of Article 220~~ , as applicable. In no case shall the rating be lower than specified in 230.79(A), (B), (C), or (D).

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. The text is revised to to comply with the NEC Style Manual Section 4.1.4, regarding the use of Parts.

4.1.4 References to an Entire Article. References shall not be made to an entire article, except for the Article 100 or where referenced to provide the necessary context. References to specific parts within articles shall be permitted. References to all parts of an article shall not be permitted. The article number shall precede the part number.

The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 23 21:30:42 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9169-NFPA 70-2024
Statement: The text is revised to comply with the NEC Style Manual section 4.1.4.

Public Input No. 1345-NFPA 70-2023 [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 DISCONNECTNOT 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 energy management 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:

(12) Meter-mounted transfer switch

(13) Not service equipment

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

(15) Listed permanently mounted, absence of voltage detection devices and absence of voltage testers for verifying absence of voltage.

(16) Informational Note No. 1: See UL 61010-1 , *Electrical Equipment for Measurement, Control and Laboratory Use - Part 1: General Requirements* , and UL 61010-2-030, *Electrical Equipment for Measurement, Control, and Laboratory Use - Part 2-030: Particular Requirements for Testing and Measuring Circuits* for construction and testing requirements for permanently mounted absence of voltage detection devices.

(17) Informational Note No. 2: See UL 1436 , *Outlet Circuit Testers and Other Similar Indicating Devices,* for construction and testing requirements for permanently mounted absence of voltage testers.

Additional Proposed Changes

File Name	Description	Approved

NEC_230.82_Absence_of_Voltage_Detection_Devices_submitted.docx	NEC 230.82 Absence of Voltage Detection Devices - New list item 13

Statement of Problem and Substantiation for Public Input

An absence of voltage detection device is a permanently-mounted device that is used to verify that a circuit is de-energized prior to opening an electrical enclosure that contains energized electrical conductors and circuit parts. An absence of voltage detection device is provided with voltage test points that allow for insertion of meter probes to perform absence of voltage tests from outside an electrical enclosure.

An absence of voltage tester (AVT) is a permanently-mounted test device that is used to verify that a circuit is de-energized prior to opening an electrical enclosure that contains energized electrical conductors and circuit parts. An AVT is provided with a test circuit with active indications to verify the absence of phase-to-phase voltage and phase-to-ground voltage. AVTs are provided with a test circuit and visual indicators to confirm that the tester is functioning properly before and after the process of determining that voltage is absent.

Testing for the absence of voltage is part of the process for establishing and verifying an electrically safe work condition as defined in the Standard for Electrical Safety in the Workplace, NFPA 70E. Section 120.5 defines all of the steps required to be performed in a specific order to establish and verify an electronically safe work condition. Section 120.5 (7) specifies the use of an adequately rated portable test instrument to test each phase conductor or circuit part to test for the absence of voltage. Each phase conductor or circuit part, both phase-to-phase and phase-to-ground shall be tested. An absence of voltage detection device is provided with voltage test points that facilitate the use of a portable test instrument to perform the required tests. The combination of the absence of voltage detection device and portable test instrument allow the tests to be conducted without opening the electrical enclosure and exposing the tester to live electrical parts and increasing the risk of an arc flash hazard.

Section 120.5 (7) Exception No. 1 recognizes the use of an AVT for absence of voltage testing. The Exception states “An adequately rated permanently mounted absence of voltage tester shall be permitted to be used to test for the absence of voltage of the conductors or circuit parts at the work location…” The text continues stating the AVT must meet certain requirements which include being listed and labeled for the purpose of testing for the absence of voltage.

Absence of voltage detection devices and AVTs provide a means to verify that a circuit is de-energized prior to opening an electrical enclosure that contains energized electrical conductors and circuit parts. This reduces the likelihood of arc flash and shock hazard as the use of these devices does not require direct contact with energized electrical conductors and circuit parts.

Using an absence of voltage detection device or AVT to verify the absence of voltage in service equipment enclosures containing the service disconnect, would require connecting the device to the supply side of the service disconnecting means. This application should be recognized in 230.82. Requiring the device to be listed, would ensure that it has been evaluated specifically for its ability to test for the absence of voltage.

The Informational Notes provide references to UL 61010-1, the Standard for Electrical Equipment for Measurement, Control and Laboratory Use - Part 1: General Requirements, and UL 61010-2-030, the Standard for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 2-030: Particular Requirements for Testing and Measuring Circuits; and UL 1436, the Standard for Outlet Circuit Testers and Other Similar Indicating Devices which contain construction and testing requirements for absence of voltage detection devices and absence of voltage testers.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 1347-NFPA 70-2023 [Definition:]	Adds UL Standards to Annex A for new listing requirement in Article 230
Public Input No. 1347-NFPA 70-2023 [Definition:]	

Submitter Information Verification

Submitter Full Name:	John Kovacik
Organization:	Trusted Safety Solutions LLC
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Sun Jul 09 12:48:50 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: It is not clear if this equipment is suitable for installation on the supply side of the service disconnect without suitable overcurrent protection and/or disconnect.

NEC 230.82

PROPOSAL:

230.82 Equipment Connected to the Supply Side of Service Disconnect.

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

- (1) Cable limiters.
- (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 energy management 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.
- (13) Listed permanently mounted, absence of voltage detection devices and absence of voltage testers for verifying absence of voltage.

  Informational Note No. 1: See UL 61010-1*, Electrical Equipment for Measurement, Control and Laboratory Use - Part 1: General Requirements,* and UL 61010-2-030, *Electrical Equipment for Measurement, Control, and Laboratory Use - Part 2-030: Particular Requirements for Testing and Measuring Circuits* for construction and testing requirements for permanently mounted absence of voltage detection devices.

  Informational Note No. 2: See UL 1436*, Outlet Circuit Testers and Other Similar Indicating Devices,* for construction and testing requirements for permanently mounted absence of voltage testers.

RATIONALE:

An absence of voltage detection device is a permanently-mounted device that is used to verify that a circuit is de-energized prior to opening an electrical enclosure that contains energized electrical conductors and circuit parts. An absence of voltage detection device is provided with voltage test points that allow for insertion of meter probes to perform absence of voltage tests from outside an electrical enclosure.

An absence of voltage tester (AVT) is a permanently-mounted test device that is used to verify that a circuit is de-energized prior to opening an electrical enclosure that contains energized electrical conductors and circuit parts. An AVT is provided with a test circuit with active indications to verify the absence of phase-to-phase voltage and phase-to-ground voltage. AVTs are provided with a test circuit and visual indicators to confirm that the tester is functioning properly before and after the process of determining that voltage is absent.

Testing for the absence of voltage is part of the process for establishing and verifying an electrically safe work condition as defined in the Standard for Electrical Safety in the Workplace, NFPA 70E. Section 120.5 defines all of the steps required to be performed in a specific order to establish and verify an electronically safe work condition.

Section 120.5 (7) specifies the use of an adequately rated portable test instrument to test each phase conductor or circuit part to test for the absence of voltage. Each phase conductor or circuit part, both phase-to-phase and phase-to-ground shall be tested. An absence of voltage detection device is provided with voltage test points that facilitate the use of a portable test instrument to perform the required tests. The combination of the absence of voltage detection device and portable test instrument allow the tests to be conducted without opening the electrical enclosure and exposing the tester to live electrical parts and increasing the risk of an arc flash hazard.

Section 120.5 (7) Exception No. 1 recognizes the use of an AVT for absence of voltage testing. The Exception states “An adequately rated permanently mounted absence of voltage tester shall be permitted to be used to test for the absence of voltage of the conductors or circuit parts at the work location…” The text continues stating the AVT must meet certain requirements which include being listed and labeled for the purpose of testing for the absence of voltage.

Absence of voltage detection devices and AVTs provide a means to verify that a circuit is de-energized prior to opening an electrical enclosure that contains energized electrical conductors and circuit parts. This reduces the likelihood of arc flash and shock hazard as the use of these devices does not require direct contact with energized electrical conductors and circuit parts.

Using an absence of voltage detection device or AVT to verify the absence of voltage in service equipment enclosures containing the service disconnect, would require connecting the device to the supply side of the service disconnecting means. This application should be recognized in

230.82. Requiring the device to be listed, would ensure that it has been evaluated specifically for its ability to test for the absence of voltage.

The Informational Notes provide references to UL 61010-1, the Standard for Electrical Equipment for Measurement, Control and Laboratory Use - Part 1: General Requirements, and UL 61010-2-030, the Standard for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 2-030: Particular Requirements for Testing and Measuring Circuits; and UL 1436, the Standard for Outlet Circuit Testers and Other Similar Indicating Devices which contain construction and testing requirements for absence of voltage detection devices and absence of voltage testers.

PROPOSAL:

Table A.1(a) Product Safety Standards for Conductors and Equipment That Have an Associated Listing Requirement

Article	Standard Number	Standard Title
230	UL 61010-1	Electrical Equipment for Measurement, Control and Laboratory Use - Part 1: General Requirements
	UL 61010-2-030	Electrical Equipment for Measurement, Control, and Laboratory Use - Part 2-030: Particular Requirements for Testing and Measuring Circuits
	UL 1436	Outlet Circuit Testers and Other Similar Indicating Devices

RATONALE:

This is a companion proposal to the proposal for Section 230.82 which proposes a listing requirement for absence of voltage detection devices and absence of voltage testers. UL 61010-1 and UL 61010-2-030 are standards for absence of voltage detection devices, and UL 1436 is a standard which covers absence of voltage testers

Public Input No. 2025-NFPA 70-2023 [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 DISCONNECTNOT 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 energy management 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)

(12) 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:

(13) Meter-mounted transfer switch

(14) Not service equipment

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

Statement of Problem and Substantiation for Public Input

This public input is being submitted on behalf of the Minnesota Department of Labor and Industry. Currently, the Department's inspection staff includes 14-office/field staff, 12-state field inspectors, 2-virtual inspectors and 50 plus contract electrical inspectors that complete over 170,000 electrical inspections annually.

The proposed deletion of (10) is necessary, if the required disconnect is a service disconnect. The requirements for the service disconnect are covered in other parts of the Article.

See companion PI(s) for 230.85 for substantiation and 230.70.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 1925-NFPA 70-2023 [Sections 230.85, 230.85]	Proposed deletion of 230.85 with substantiation.

Submitter Information Verification

Submitter Full Name: Dean Hunter
Organization: Minnesota Department of Labor
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Submittal Date: Fri Aug 11 09:43:45 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9174-NFPA 70-2024

Statement: List item (10) is deleted as the service disconnect is now required to be the emergency disconnect in conjunction with the First Revision to Section 230.70.

Additionally, the text for list items (2), (3) and (6) is revised to comply with the NEC Style Manual, Section 4.1.4.

Concerning Public Input No. 531, the revised text provides clarity that the equipment housing the disconnect or disconnecting means is suitably marked.

With the identification in the title and scope of the Article that the requirements apply to certain voltage ranges, the inclusion of this detail in this section is unnecessary.

Public Input No. 2584-NFPA 70-2023 [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 DISCONNECTNOT 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 energy management 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:

(12) Meter-mounted transfer switch

(13) Not service equipment

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

Statement of Problem and Substantiation for Public Input

This PI is being submitted in conjunction with other PI's with the intent to require service disconnect(s) for one- and two-family dwellings to be located at a readily accessible location on the outside of the dwelling so the requirements of 230.85 can simply be deleted.
The requirements of 230.85 regarding emergency disconnects for dwellings have become lengthy, complicated, and confusing. The issue becomes even more complicated when trying to address the grounding and bonding

requirements of Article 250 when dealing with a disconnect located on the supply side of the service disconnect. The whole concept regarding a readily accessible emergency disconnect on the outside of the dwelling would be greatly simplified if the main service disconnect(s) for the dwelling were to simply be required on the outside of the dwelling. By doing so there would always be a readily accessible disconnect for first responders, and there would not be a need for all the excessive clarifications and additional requirements currently found in Section 230.85. NFPA is on a mission to make the NEC more user-friendly and this, and the associated proposed PI's, help with this goal in mind and removes more than half a page of unnecessary requirements.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2582-NFPA 70-2023 [Section No. 230.70(A)(1)]	
Public Input No. 2583-NFPA 70-2023 [Section No. 230.85]	
Public Input No. 2582-NFPA 70-2023 [Section No. 230.70(A)(1)]	
Public Input No. 2583-NFPA 70-2023 [Section No. 230.85]	

Submitter Information Verification

Submitter Full Name: Douglas Smith
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City:
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Submittal Date: Tue Aug 22 23:10:18 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9174-NFPA 70-2024

Statement: List item (10) is deleted as the service disconnect is now required to be the emergency disconnect in conjunction with the First Revision to Section 230.70.

Additionally, the text for list items (2), (3) and (6) is revised to comply with the NEC Style Manual, Section 4.1.4.

Concerning Public Input No. 531, the revised text provides clarity that the equipment housing the disconnect or disconnecting means is suitably marked.

With the identification in the title and scope of the Article that the requirements apply to certain voltage ranges, the inclusion of this detail in this section is unnecessary.

Public Input No. 2641-NFPA 70-2023 [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 Articvle 250, Part VII and bonded in accordance with ~~Part V of~~ Article 250 , Part V .

(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 Article 250, Part VII and bonded in accordance with ~~Part V of~~ Article 250 , Part V . 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 DISCONNECTNOT 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 energy management 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 , Part VII .

(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 Article 250, Part VII and bonded in accordance with ~~Part V of~~ Article 250 , Part V

(11) .

(12) 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:

  (13) Meter-mounted transfer switch

  (14) Not service equipment

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

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. The text is revised to to comply with the NEC Style Manual Section

4.1.4, regarding the use of Parts.
4.1.4 References to an Entire Article. References shall not be made to an entire article, except for the Article 100 or where referenced to provide the necessary context. References to specific parts within articles shall be permitted. References to all parts of an article shall not be permitted. The article number shall precede the part number.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 23 21:31:30 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9174-NFPA 70-2024

Statement: List item (10) is deleted as the service disconnect is now required to be the emergency disconnect in conjunction with the First Revision to Section 230.70.

Additionally, the text for list items (2), (3) and (6) is revised to comply with the NEC Style Manual, Section 4.1.4.

Concerning Public Input No. 531, the revised text provides clarity that the equipment housing the disconnect or disconnecting means is suitably marked.

With the identification in the title and scope of the Article that the requirements apply to certain voltage ranges, the inclusion of this detail in this section is unnecessary.

Public Input No. 3167-NFPA 70-2023 [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 DISCONNECTNOT 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 energy management 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:

(12) Meter-mounted transfer switch

(13) Not service equipment

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

Statement of Problem and Substantiation for Public Input

Deleting text about grounding and bonding, since we have 250.25 that address the grounding and bonding requirements of 'supply-side' disconnects. The proposed revisions will improve redundancy between 230.82 and 250.25.

Submitter Information Verification

Submitter Full Name: Mike Holt
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Street Address:
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State:
Zip:
Submittal Date: Tue Aug 29 20:40:19 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The cross referencing of grounding and bonding requirements is considered to improve usability of the Code. There was no substantiation provided as to the problem with the cross-referencing and need to remove the references.

Public Input No. 4193-NFPA 70-2023 [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 DISCONNECTNOT 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 energy management 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~~ meeting the requirements as specified in Part V through Part VII of Article 230, excluding 230.67.

(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:

(12) Meter-mounted transfer switch

(13) Not service equipment

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

Statement of Problem and Substantiation for Public Input

Previous wording of 230.82(6) only required disconnects for power production systems (interconnecting on the supply side of a building's service disconnecting means) to comply with Part VII of Article 230. However, the guarding and barrier requirements of 230.62 should be included for the safety of maintenance personnel while servicing load terminations in the disconnect. In addition the requirements for location of disconnects and number/grouping of disconnects for power production system disconnects should be required to ensure that first responders can effectively and quickly disconnect the electric utility source of power to power production systems.

Submitter Information Verification

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State:	
Zip:	
Submittal Date:	Wed Sep 06 20:36:47 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: The added requirements exist in Section 705.11 and it is not necessary to restate them here.

Public Input No. 4371-NFPA 70-2023 [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 DISCONNECTNOT 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 energy management 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:

(12) Meter-mounted transfer switch

(13) Not service equipment

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

Informational Note: See IEEE 3001.8 Recommended Practice for the Instrumentation and Metering of Industrial and Commercial Power Systems for more information

Statement of Problem and Substantiation for Public Input

This is another slice of updated content from the legacy IEEE Color Books. While much guidance is provided by utilities on metering the line side of the service point; more depth may be found is provided by this title. From its prospectus:

"This recommended practice covers the instrumentation and metering of industrial and commercial power systems. It describes the importance of metering to achieve a successful energy management process, as well as considerations that must be made when applying the latest metering technology."

https://standards.ieee.org/standard/3001_8-2013.html

Submitter Information Verification

Submitter Full Name: Michael Anthony
Organization: Standards Michigan LLC
Affiliation: IEEE Education & Healthcare Facilities Committee
Street Address:
City:
State:
Zip:
Submittal Date: Thu Sep 07 13:16:11 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The addition of the referenced IEEE standard does not improve usability as this section is not specific to instrumentation and metering of power systems. Per section 2.1.10 of the NEC Style Manual, the proposed informational note is not necessary.

Public Input No. 531-NFPA 70-2023 [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 <u>in equipment</u> legibly field marked on its exterior in a manner suitable for the environment as follows:

METER DISCONNECTNOT 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 energy management 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 <u>in equipment</u> 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 <u>within which the emergency disconnects</u> are <u>installed are</u> 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:

(12) <u>Meter-mounted transfer switch</u>

(13) <u>Not service equipment</u>

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

Statement of Problem and Substantiation for Public Input

This changes in this section seeks to add clarity and accuracy to how the term disconnect is being used. The term “Disconnecting Means” is defined in ARticle 100 as: “A device, or group of devices, or other means by which the conductors of a circuit can be disconnected from their source of supply. (CMP-1)”. A disconnect can be a circuit breaker which does not include the assembly within which it is installed. This public input suggests language changes with the following substantiation:

List item (3): A disconnect can be a circuit breaker or a switch both of which are located within an enclosure which is marked here. the disconnect itself is not marked. This change clarifies what is required to be marked.

List item (6): This change addresses the fact that a disconnecting means cannot be “listed as suitable for use as service equipment” but the equipment within which the disconnecting means is found can be “listed as suitable for use as service equipment.” This change adds clarity and accuracy.

List item (10): List Item 10 language for the enclosure requirements applies to the enclosures within which the emergency disconnects are installed. This change adds clarity and accuracy.

Submitter Information Verification

Submitter Full Name: Thomas Domitrovich
Organization: Eaton Corporation
Street Address:
City:
State:
Zip:
Submittal Date: Wed Apr 05 06:59:14 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9174-NFPA 70-2024

Statement: List item (10) is deleted as the service disconnect is now required to be the emergency disconnect in conjunction with the First Revision to Section 230.70.

Additionally, the text for list items (2), (3) and (6) is revised to comply with the NEC Style Manual, Section 4.1.4.

Concerning Public Input No. 531, the revised text provides clarity that the equipment housing the disconnect or disconnecting means is suitably marked.

With the identification in the title and scope of the Article that the requirements apply to certain voltage ranges, the inclusion of this detail in this section is unnecessary.

Public Input No. 2578-NFPA 70-2023 [Section No. 230.85]

230.85 Emergency Disconnects.

For one- and two-family dwelling units, an emergency disconnecting means shall be installed.

(A) General.

(1) Location.

The disconnecting means shall be installed in a readily accessible outdoor location on or within sight of the dwelling unit.

Exception: Where the requirements of 225.41 are met, this section shall not apply.

(2) Rating.

The disconnecting means shall have a short-circuit current rating equal to or greater than the available fault current.

(3) Grouping.

If more than one disconnecting means is provided, they shall be grouped.

(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” includes the factory marking “Service Disconnect”.~~

a service disconnect.

(C) Replacement.

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

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

(D) Identification of Other Isolation Disconnects.

Where 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 equipment for isolation of other energy sources shall be located adjacent to the disconnecting means required by this section.

Informational Note: See 445.18, 480.7, 705.20, and 706.15 for examples of other energy source system isolation means.

(E) Marking.

(1) Marking Text.

The ~~disconnecting means shall marked as follows: Service disconnect service disconnect shall be marked EMERGENCY DISCONNECT, SERVICE DISCONNECT Meter disconnects installed in accordance with 230.82~~

(

~~3) and marked as follows:~~

~~EMERGENCY DISCONNECT, METER DISCONNECT, NOT SERVICE EQUIPMENT~~

- ~~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 (½ in.) high.

Additional Proposed Changes

File Name	Description	Approved
230.85_.pdf	230.85, Terra has a Mind of it's own	

Statement of Problem and Substantiation for Public Input

The section includes additional disconnects that make this section very difficult to properly enforce. Meter Disconnect? What is a meter disconnect, we know that Google has all kinds of images. All of the Meter Disconnects that I have seen have been installed ahead of the service point and not under the scope of the NEC. Other Disconnecting Means is so open and could be interpreted to include disconnects other than those designed for this application. By making this revision it will provide uniform applications and enforcement. The present wording is an enforcement nightmare and need to be corrected.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 22 16:01:08 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9179-NFPA 70-2024

Statement: In conjunction with the proposed First Revision to section 230.70, section 230.85 has been proposed to be deleted as emergency disconnects are now service disconnects.

Public Input No. 2583-NFPA 70-2023 [Section No. 230.85]

~~**230.85** Emergency Disconnects.~~

~~For one- and two-family dwelling units, an emergency disconnecting means shall be installed.~~

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

~~**(1)** Location.~~

~~The disconnecting means shall be installed in a readily accessible outdoor location on or within sight of the dwelling unit.~~

~~*Exception: Where the requirements of 225.41 are met, this section shall not apply.*~~

~~**(2)** Rating.~~

~~The disconnecting means shall have a short-circuit current rating equal to or greater than the available fault current.~~

~~**(3)** Grouping.~~

~~If more than one disconnecting means is provided, they shall be grouped.~~

~~**(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” includes the factory marking “Service Disconnect”.~~

~~**(C)** Replacement.~~

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

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

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

~~Where 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 equipment for isolation of other energy sources shall be located adjacent to the disconnecting means required by this section.~~

> ~~Informational Note: See 445.18 , 480.7 , 705.20 , and 706.15 for examples of other energy source system isolation means.~~

~~**(E)** Marking.~~

~~(1) Marking Text.~~

~~The disconnecting means shall marked as follows:~~

(1) ~~Service disconnect~~

~~EMERGENCY DISCONNECT, SERVICE DISCONNECT~~

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

~~EMERGENCY DISCONNECT, METER DISCONNECT, NOT SERVICE EQUIPMENT~~

(3) ~~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.~~

Statement of Problem and Substantiation for Public Input

This PI is being submitted in conjunction with other PI's with the intent to require service disconnect(s) for one- and two-family dwellings to be located at a readily accessible location on the outside of the dwelling so the requirements of 230.85 can simply be deleted.
The requirements of 230.85 regarding emergency disconnects for dwellings have become lengthy, complicated, and confusing. The issue becomes even more complicated when trying to address the grounding and bonding requirements of Article 250 when dealing with a disconnect located on the supply side of the service disconnect.
The whole concept regarding a readily accessible emergency disconnect on the outside of the dwelling would be greatly simplified if the main service disconnect(s) for the dwelling were to simply be required on the outside of the dwelling. By doing so there would always be a readily accessible disconnect for first responders, and there would not be a need for all the excessive clarifications and additional requirements currently found in Section 230.85.
NFPA is on a mission to make the NEC more user-friendly and this, and the associated proposed PI's, help with this goal in mind and removes more than half a page of unnecessary requirements.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2582-NFPA 70-2023 [Section No. 230.70(A)(1)]	
Public Input No. 2584-NFPA 70-2023 [Section No. 230.82]	
Public Input No. 2582-NFPA 70-2023 [Section No. 230.70(A)(1)]	
Public Input No. 2584-NFPA 70-2023 [Section No. 230.82]	

Submitter Information Verification

Submitter Full Name: Douglas Smith
Organization: West Coast Code Consultants (WC-3)
Street Address:
City:
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Zip:
Submittal Date: Tue Aug 22 23:06:16 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9179-NFPA 70-2024

Statement: In conjunction with the proposed First Revision to section 230.70, section 230.85 has been proposed to be deleted as emergency disconnects are now service disconnects.

Public Input No. 3801-NFPA 70-2023 [Section No. 230.85]

230.85 Emergency Disconnects.

For one- and two-family dwelling units, an emergency disconnecting means shall be installed.

(A) General.

(1) Location.

The disconnecting means shall be installed in a readily accessible outdoor location on or within sight of the dwelling unit.

Exception: Where the requirements of 225.41 are met, this section shall not apply.

(2) Rating.

The disconnecting means shall have a short-circuit current rating equal to or greater than the available fault current.

(3) Grouping.

If more than one disconnecting means is provided, they shall be grouped.

(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” includes the factory marking “Service Disconnect”.~~

a service disconnect.

(C) Replacement.

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

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

(D) Identification of Other Isolation Disconnects.

Where 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 equipment for isolation of other energy sources shall be located adjacent to the disconnecting means required by this section.

Informational Note: See 445.18, 480.7, 705.20, and 706.15 for examples of other energy source system isolation means.

(E) Marking.

(1) Marking Text.

The disconnecting means shall ~~marked as follows: Service disconnect~~ be marked ~~EMERGENCY DISCONNECT, SERVICE DISCONNECT~~ ~~Meter disconnects installed in accordance with 230.82~~

~~(~~

~~3) and marked as follows:~~

~~EMERGENCY DISCONNECT, METER DISCONNECT, NOT SERVICE EQUIPMENT~~

- ~~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 (½ in.) high.

Statement of Problem and Substantiation for Public Input

The section includes additional disconnects that make this section very difficult to properly enforce. Meter Disconnect? What is a meter disconnect,
we know that Google has all kinds of images. All of the Meter Disconnects that I have seen have been installed ahead of the service point and not
under the scope of the NEC.

Other Disconnecting Means is so open and could be interpreted to include disconnects other than those designed for this application.

By making this revision it will provide uniform applications and enforcement. The present wording is an enforcement nightmare and need to be corrected.

Submitter Information Verification

Submitter Full Name: Rudy Garza
Organization: IAEI
Street Address:
City:
State:
Zip:
Submittal Date: Tue Sep 05 17:09:44 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9179-NFPA 70-2024

Statement: In conjunction with the proposed First Revision to section 230.70, section 230.85 has been proposed to be deleted as emergency disconnects are now service disconnects.

Public Input No. 533-NFPA 70-2023 [Section No. 230.85]

230.85 Emergency Disconnects.

For one- and two-family dwelling units, an emergency disconnecting means shall be installed.

(A) General.

(1) Location.

The disconnecting means shall be installed in a readily accessible outdoor location on or within sight of the dwelling unit.

Exception: Where the requirements of 225.41 are met, this section shall not apply.

(2) Rating.

The equipment within which the disconnecting means is installed shall have a short-circuit current rating equal to or greater than the available fault current.

(3) Grouping.

If more than one disconnecting means is provided, they shall be grouped.

(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 integral to equipment 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” includes the factory marking “Service Disconnect”.

(C) Replacement.

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

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

(D) Identification of Other Isolation Disconnects.

Where 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 equipment for isolation of other energy sources shall be located adjacent to the disconnecting means required by this section.

Informational Note: See 445.18, 480.7, 705.20, and 706.15 for examples of other energy source system isolation means.

(E) Marking.

(1) Marking Text.

The equipment within which the disconnecting means is installed shall be marked as follows:

(1) Service disconnect

EMERGENCY DISCONNECT, SERVICE DISCONNECT

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

EMERGENCY DISCONNECT, METER DISCONNECT, NOT SERVICE EQUIPMENT

(3) 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 (½ in.) high.

Statement of Problem and Substantiation for Public Input

This changes in this section seeks to add clarity and accuracy to how the term disconnect is being used. The term “Disconnecting Means” is defined in ARticle 100 as: “A device, or group of devices, or other means by which the conductors of a circuit can be disconnected from their source of supply. (CMP-1)”. A disconnect can be a circuit breaker which does not include the assembly within which it is installed. This public input suggests language changes with the following substantiation:

230.85(A)(2)Rating: The disconnect, which could be a circuit breaker for example, does not have a short-circuit current rating. the equipment within which the disconnect is installed can have an SCCR. The suggested changes seek to add clarity and accuracy to this section.

230.85(B)(3): The disconnecting means (i.e. circuit breaker) is not marked but rather the equipment is to be marked.. 230.85(E)(2)(1) makes this clear by stating that the markings or labels are to be located on the outside front of the disconnect enclosure and are not permitted to be on the disconnect itself. The suggested change here seeks to add clarity and accuracy to this section.

230.85(E) Marking: Clarity is being added to indicate that it is the equipment that contains the disconnecting means which is to be marked and not the disconnecting means itself. This is in alignment with 230.85(E)(2)(1) which requires that the markings or labels are to be located on the outside front of the disconnect enclosure and are not permitted to be on the disconnect itself.

Submitter Information Verification

Submitter Full Name: Thomas Domitrovich

Organization: Eaton Corporation

Street Address:

City:

State:

Zip:

Submittal Date: Wed Apr 05 09:32:14 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: The concerns of the submitters have been resolved as section 230.85 has been proposed for deletion and the proposed revised section 230.70 requires the emergency disconnect to be the service disconnect. The markings and suitability of service equipment are addressed in Part V of Article 230.

Public Input No. 1925-NFPA 70-2023 [Sections 230.85, 230.85]

~~**Sections 230.85, 230.85**~~

~~**230.85** Emergency Disconnects.~~

~~For one- and two-family dwelling units, an emergency disconnecting means shall be installed.~~

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

~~**(1)** Location.~~

~~The disconnecting means shall be installed in a readily accessible outdoor location on or within sight of the dwelling unit.~~

~~*Exception: Where the requirements of 225.41 are met, this section shall not apply.*~~

~~**(2)** Rating.~~

~~The disconnecting means shall have a short-circuit current rating equal to or greater than the available fault current.~~

~~**(3)** Grouping.~~

~~If more than one disconnecting means is provided, they shall be grouped.~~

~~**(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" includes the factory marking "Service Disconnect".~~

~~**(C)** Replacement.~~

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

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

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

~~Where 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 equipment for isolation of other energy sources shall be located adjacent to the disconnecting means required by this section.~~

~~Informational Note: See 445.18 , 480.7 , 705.20 , and 706.15 for examples of other energy source system isolation means.~~

~~**(E)** Marking.~~

~~**(1)** Marking Text.~~

~~The disconnecting means shall marked as follows:~~

(1) ~~Service disconnect~~

~~EMERGENCY DISCONNECT, SERVICE DISCONNECT~~

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

~~EMERGENCY DISCONNECT, METER DISCONNECT, NOT SERVICE EQUIPMENT~~

(3) ~~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.~~

~~**230.85** Emergency Disconnects.~~

~~For one- and two-family dwelling units, an emergency disconnecting means shall be installed.~~

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

~~**(1)** Location.~~

~~The disconnecting means shall be installed in a readily accessible outdoor location on or within sight of the dwelling unit.~~

~~*Exception: Where the requirements of 225.41 are met, this section shall not apply.*~~

~~**(2)** Rating.~~

~~The disconnecting means shall have a short-circuit current rating equal to or greater than the available fault current.~~

~~**(3)** Grouping.~~

~~If more than one disconnecting means is provided, they shall be grouped.~~

~~**(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” includes the factory marking “Service Disconnect”.~~

~~**(C)** Replacement.~~

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

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

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

~~Where 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 equipment for isolation of other energy sources shall be located adjacent to the disconnecting means required by this section.~~

~~Informational Note: See 445.18 , 480.7 , 705.20 , and 706.15 for examples of other energy source system isolation means.~~

~~(E) Marking.~~

~~(1) Marking Text.~~

~~The disconnecting means shall marked as follows:~~

(1) ~~Service disconnect~~

~~EMERGENCY DISCONNECT, SERVICE DISCONNECT~~

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

~~EMERGENCY DISCONNECT, METER DISCONNECT, NOT SERVICE EQUIPMENT~~

(3) ~~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.~~

Statement of Problem and Substantiation for Public Input

This public input is being submitted on behalf of the Minnesota Department of Labor and Industry. Currently, the Department's inspection staff includes 14-office/field staff, 12-state field inspectors, 2-virtual inspectors and 50 plus contract electrical inspectors that complete over 170,000 electrical inspections annually.

This section is confusing for enforcement authorities and installers. This disconnect should be a "service disconnect". The inconsistencies with how we treat an "emergency disconnect", in our opinion, conflicts with many other sections of the NEC – not to mention the confusion between equipment manufacturer's as to how these disconnects are to be used.

(2) which refers to a meter disconnect is problematic. The NEC doesn't regulate the installation of the disconnect on the supply side of the service point when provided by a utility for "cold sequence" meter removal. In our opinion, to require that the fault current rating for these disconnects would be a moot point because enforcers would not have jurisdiction over the installation.

Our assumption is that the (3) disconnect is a product of UL 98. and technically, this disconnect could be a non-fused switch. This equipment is marked with an available fault current rating assuming that the overcurrent protection is somewhere downstream. We would contend that electrical safety could be compromised because this disconnect is intended to be used by individuals in dire circumstances. If the service entrance conductors are being compromised at the structure, and there ends up being a fault between the ungrounded conductors, the conductors may not have overcurrent protection downstream. Another issue could be that the service overcurrent device in the home could simply be "off", therefore not providing any available fault current protection for the UL 98 switch. That said, being in proximity of the disconnect or operating the switch could be dangerous. In addition, other code concerns to consider:

• What about barriers? This is not a service disconnect so 230.62(C) would not apply.
• The name? Meeting the language in (3) would allow a service disconnect (with overcurrent) to be called something other than a "service".
Confusion about the grounding electrode or an equipment grounding conductor being extended to the home is inconsistent with other parts of the code. In our opinion, the conductors extended from a service disconnect should always be considered a feeder – for consistency.
• The disconnect doesn't comply with the exceptions in section 230.94

Until the UL guide card was recently updated, equipment manufacturers were not consistent in their messaging

regarding non-fused disconnects. Consequently, inspectors and installers were/are confused by the requirements.
Eaton: “must be properly protected by ….”
Schneider/Square D: “used in conjunction with …..”
Siemens: “upstream fuse of circuit breaker protecting the non-fused switch ….”

See companion PI(s) for 230.70.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2021-NFPA 70-2023 [Section No. 230.70(A)]	Relocated language from 230.85.
Public Input No. 2022-NFPA 70-2023 [Section No. 230.70(B)]	Relocated language from 230.85.
Public Input No. 2023-NFPA 70-2023 [Section No. 230.70(C)]	Relocated language from 230.85.
Public Input No. 2021-NFPA 70-2023 [Section No. 230.70(A)]	
Public Input No. 2022-NFPA 70-2023 [Section No. 230.70(B)]	
Public Input No. 2023-NFPA 70-2023 [Section No. 230.70(C)]	
Public Input No. 2025-NFPA 70-2023 [Section No. 230.82]	

Submitter Information Verification

Submitter Full Name: Dean Hunter
Organization: Minnesota Department of Labor
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 07 15:37:20 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9179-NFPA 70-2024
Statement: In conjunction with the proposed First Revision to section 230.70, section 230.85 has been proposed to be deleted as emergency disconnects are now service disconnects.

Public Input No. 3476-NFPA 70-2023 [Section No. 230.85(A)(1)]

(1) Location.

The disconnecting means shall be installed in a readily accessible outdoor location on or within sight of the ~~dwelling unit~~ structure .

Exception 1 : Where the requirements of 225.41 are met, this section shall not apply.

Exception 2: Where a shunt trip button is installed, it too shall be located in a readily accessible outdoor location.

Statement of Problem and Substantiation for Public Input

A subsequent change to the PI submitted for 230.85.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3475-NFPA 70-2023 [Section No. 230.85 [Excluding any Sub-Sections]]	Related verbiage

Submitter Information Verification

Submitter Full Name: David Engelhart
Organization: Collier County Gmd
Street Address:
City:
State:
Zip:

Submittal Date: Sun Sep 03 17:51:24 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: No substantiation has been provided to extend the emergency disconnect to all structures beyond one- and two-family dwelling units or to allow for shunt trips to serve as the emergency disconnecting means.

Public Input No. 4221-NFPA 70-2023 [Section No. 230.85(A)(1)]

(1) Location.

The disconnecting means shall be installed in a readily accessible outdoor location on or within sight of the dwelling unit. <u>Emergency disconnecting means shall be permitted to be locked in the closed position.</u>

Exception: Where the requirements of 225.41 are met, this section shall not apply.

Statement of Problem and Substantiation for Public Input

In NY City during the code revision, vandalism was a big concern and since the 2020 NEC did not provide a clarification about the locking off the emergency disconnecting means, it posed an impasse over adapting this new provision into NY City Electrical Code. A clear language will simplify and remove any ambiguity about the locking and securing the emergency disconnect.

Submitter Information Verification

Submitter Full Name: Mathher Abbassi
Organization: Abbassi Electric Corp.
Street Address:
City:
State:
Zip:

Submittal Date: Wed Sep 06 23:38:54 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The concerns of the submitter have been resolved as section 230.85 has been proposed for deletion and the proposed revised section 230.70 requires the service disconnect to be the emergency disconnect. Service disconnects are required to be readily accessible, and per the definition of readily accessible, keys to open locks are permitted.

Public Input No. 1419-NFPA 70-2023 [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

(4) A listed circuit breaker in an enclosure 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” includes the factory marking “Service Disconnect”.

Statement of Problem and Substantiation for Public Input

This revision is necessary to separate circuit breaker requirements from the requirements for other switches, and to distinguish a switch from its enclosure. Enclosed switches, and transfer switches for example may or may not be suitable for use as "service equipment" depending on whether there is a bonding provision for bonding the grounded (neutral) conductor to the enclosure. I have seen many enclosed switches and transfer switches marked this way. There are also many other types of switches including, snap switches, and molded case switches that are entirely separate components from the enclosure where they are installed.

Here is some UL Guide information about enclosed switches. Product category WIAX

"Switches are marked with their short-circuit current rating(s) in rms symmetrical amps.

Enclosed switches may also be suitable for use as service switches. Such switches are marked "Suitable for Use as Service Equipment."

Some enclosed switches incorporate neutrals factory bonded to the enclosure. Such switches are marked "Suitable Only for Use as Service Equipment."

Enclosed switches marked for use at services may also be used to provide the main control and means of cutoff for a separately derived system, or for a second building."

Circuit breakers, molded case switches, and snap switches on the other hand are completely independent of the enclosure that they are installed in. I have never seen a circuit breaker itself marked "suitable for use as service equipment".To the best of my knowledge, they are simply not marked this way. I have however seen circuit breaker enclosures marked this way. Circuit breakers and circuit breaker enclosures are 2 separate pieces of equipment! This distinction needs to be recognized in the Code language.

Here is some UL Guide information about circuit breakers and circuit breaker enclosures. Product category DIVQ.

"These circuit breakers are intended for use with certified enclosures, or as part of other certified equipment, or without enclosures where acceptable.

Circuit-breaker enclosures marked for service equipment use may also be used to provide the main control and means of cutoff for a separately-derived system or a second building.

Circuit-breaker enclosures that are suitable for use as service equipment are marked accordingly."

Here is some UL Guide information about molded case switches. Product category WJAZ

"Some enclosed molded-case switches are marked as suitable for use as service equipment."

Here is some UL Guide information about transfer switches

"Transfer switches intended for use as service equipment are marked "SUITABLE FOR USE AS SERVICE EQUIPMENT."

This revision will help clarify which equipment can be used to satisfy these requirements. It will also clarify that the ENCLOSURE for a circuit breaker must be marked as suitable for use as service equipment.

Submitter Information Verification

Submitter Full Name:	Russ Leblanc
Organization:	Leblanc Consulting Services
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Sat Jul 15 09:54:50 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: The concerns of the submitters have been resolved as section 230.85 has been proposed for deletion and the proposed revised section 230.70 requires the emergency disconnect to be the service disconnect. The markings and suitability of service equipment are addressed in Part V of Article 230.

Public Input No. 185-NFPA 70-2023 [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~~ equipment 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" includes the factory marking "Service Disconnect".

Statement of Problem and Substantiation for Public Input

There should be no restriction on the type of equipment that can be used as the emergency disconnect, other than the equipment must be listed as "suitable for use as service equipment".

Submitter Information Verification

Submitter Full Name: Don Ganiere

Organization: none

Street Address:

City:

State:

Zip:

Submittal Date: Tue Jan 17 13:51:21 EST 2023

Committee: NEC-P10

Committee Statement

Resolution: The concerns of the submitters have been resolved as section 230.85 has been proposed for deletion and the proposed revised section 230.70 requires the emergency disconnect to be the service disconnect. The markings and suitability of service equipment are addressed in Part V of Article 230.

Public Input No. 3249-NFPA 70-2023 [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, or transfer switch 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” includes the factory marking “Service Disconnect”.

Statement of Problem and Substantiation for Public Input

Clearly if a service rated transfer switch is suitable to meet the requirements of 230.85(B)(1), then it should be suitable to meet the requirements of 230.85(B)(3), when it’s not used as the service disconnect. Adding transfer switch to 230.85(B)(3) will bring clarity to Code users.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 30 17:31:58 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The concerns of the submitters have been resolved as section 230.85 has been proposed for deletion and the proposed revised section 230.70 requires the emergency disconnect to be the service disconnect. The markings and suitability of service equipment are addressed in Part V of Article 230.

Public Input No. 3251-NFPA 70-2023 [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(B)(2) and 230.85(B)(3) are service conductors.

Informational Note 2: Equipment marked "Suitable only for use as service equipment" includes the factory marking "Service Disconnect".

Statement of Problem and Substantiation for Public Input

Corrected the informational note 1 with the proper references.

Submitter Information Verification

Submitter Full Name:	Mike Holt
Organization:	Mike Holt Enterprises Inc
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Aug 30 17:37:00 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: Section 230.85 has been proposed to be deleted and as such this correction is no longer needed.

Public Input No. 4427-NFPA 70-2023 [Section No. 230.85(B)]

(B) ~~Disconnects~~ Disconnect .

~~Each~~ The service 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" includes the factory marking "Service Disconnect".~~

located outside the dwelling.

Statement of Problem and Substantiation for Public Input

To clear up any confusion with this requirement, just mandate the service disconnect be located outside the dwelling.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 4431-NFPA 70-2023 [Section No. 230.85(E)(1)]	

Submitter Information Verification

Submitter Full Name: Peter Diamond
Organization: Diamond Seminars
Street Address:
City:
State:
Zip:
Submittal Date: Thu Sep 07 15:10:48 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9179-NFPA 70-2024

Statement: In conjunction with the proposed First Revision to section 230.70, section 230.85 has been proposed to be deleted as emergency disconnects are now service disconnects.

Public Input No. 214-NFPA 70-2023 [Section No. 230.85(E)(1)]

(1) Marking Text.

The disconnecting means shall marked as follows:

(1) Service disconnect

~~EMERGENCY DISCONNECT~~ FIRST RESPONDER DISCONNECT , SERVICE DISCONNECT

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

~~EMERGENCY~~ FIRST RESPONDER DISCONNECT, METER DISCONNECT, NOT SERVICE EQUIPMENT

(3) 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~~ FIRST RESPONDER DISCONNECT, NOT SERVICE EQUIPMENT

Statement of Problem and Substantiation for Public Input

With the rearrangement of the NEC in 2020 to be more consistent with wording and location, with the use of the words EMERGENCY DISCONNECT the code is not staying consistent with its use of wording. This disconnect does not fall under the requirements of 700 and is therefore not an Emergency Disconnect. Replacing EMERGENCY with FIRST RESPONDER would properly identify what the disconnecting means is for and stay consistent with the NEC arrangement.

Submitter Information Verification

Submitter Full Name: Robert Nakamichi
Organization: City of Seattle
Street Address:
City:
State:
Zip:
Submittal Date: Sun Jan 22 16:40:09 EST 2023
Committee: NEC-P10

Committee Statement

Resolution: The term “first responder” is not recognized in the NEC. Changing the language as proposed could cause confusion for who is allowed to shut down the disconnect. The emergency disconnect is intended to be operated during emergencies and term does not conflict with a defined term in the Code. The word "emergency" is not allocated only to Article 700.

Public Input No. 4431-NFPA 70-2023 [Section No. 230.85(E)(1)]

(1) Marking Text.

The disconnecting means shall marked as follows:

(1) ~~Service disconnect~~ - ~~EMERGENCY DISCONNECT, SERVICE DISCONNECT~~

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

~~EMERGENCY DISCONNECT, METER DISCONNECT, NOT SERVICE EQUIPMENT~~

(3) ~~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~~

Statement of Problem and Substantiation for Public Input

This will be the correct marking for the emergency disconnect/service disconnect. The other markings will not be needed as the only disconnect outside will be the service disconnect.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 4427-NFPA 70-2023 [Section No. 230.85(B)]	similar change

Submitter Information Verification

Submitter Full Name: Peter Diamond
Organization: Diamond Seminars
Street Address:
City:
State:
Zip:

Submittal Date: Thu Sep 07 15:15:01 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The concerns of the submitters have been resolved as section 230.85 has been proposed for deletion and the proposed revised section 230.70 requires the emergency disconnect to be the service disconnect. The markings and suitability of service equipment are addressed in Part V of Article 230.

Public Input No. 3475-NFPA 70-2023 [Section No. 230.85 [Excluding any Sub-Sections]]

For ~~one- and two-family dwelling units~~ all structures , an emergency disconnecting means shall be installed.

Exception: An exterior mounted shunt trip button(s) for a related shunt trip breaker(s) shall be permitted.

Statement of Problem and Substantiation for Public Input

It would seem this should apply to all structures, especially for those with underground services that terminate to service equipment within a building, not just 1-2 family dwelling units.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3476-NFPA 70-2023 [Section No. 230.85(A)(1)]	

Submitter Information Verification

Submitter Full Name: David Engelhart
Organization: Collier County Gmd
Street Address:
City:
State:
Zip:

Submittal Date: Sun Sep 03 17:46:42 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: No substantiation has been provided to extend the emergency disconnect to all structures beyond one- and two-family dwelling units or to allow for shunt trips to serve as the emergency disconnecting means.

Public Input No. 4200-NFPA 70-2023 [Section No. 230.90(A)]

(A) Ungrounded Conductor.

Such protection shall be provided by an overcurrent device in series with each ungrounded service conductor that has a rating or setting not higher than the ampacity of the conductor. A set of fuses shall be considered all the fuses required to protect all the ungrounded conductors of a circuit. Single-pole circuit breakers, grouped in accordance with 230.71(B), shall be considered as one protective device.

Exception No. 1: For motor-starting currents, ratings that comply with 430.52, 430.62, and 430.63 shall be permitted.

Exception No. 2: Fuses and circuit breakers with a rating or setting that complies with 240.4(B) or (C) and 240.6 shall be permitted.

Exception No. 3: Two to six circuit breakers or sets of fuses shall be permitted as the overcurrent device to provide the overload protection. ~~The~~ If the sum of the ratings of the circuit breakers or fuses exceeds, but does not equal, 400 amps, they shall be permitted to exceed the ampacity of the service conductors, provided the calculated load does not exceed the ampacity of the service conductors.

Exception No. 4: Overload protection for fire pump supply conductors shall comply with 695.4(B)(2)(a).

Exception No. 5: Overload protection in accordance with the conductor ampacities of 310.12 shall be permitted for single-phase dwelling services.

*N **(1) Labeling.** Each service disconnecting means with a supply conductor rating less than the enclosure rating shall be labeled with a permanent placard on the exterior of the enclosure that complies with one of the following:*

(a) Service Conductors

(i) Fuses.

CAUTION: SERVICE CONDUCTOR RATING

IS LESS THAN ENCLOSURE RATING.

ENCLOSURE: _______ AMPS

MAX FUSE: _______ AMPS

(ii) Non-adjustable Trip Circuit Breakers.

CAUTION: SERVICE CONDUCTOR RATING

IS LESS THAN ENCLOSURE RATING.

ENCLOSURE: _______ AMPS

MAX BREAKER: _______ AMPS

(iii) Adjustable-Trip Circuit Breakers.

CAUTION: SERVICE CONDUCTOR RATING

IS LESS THAN ENCLOSURE RATING.

ENCLOSURE: _______ AMPS

MAX TIME DELAY TRIP: _______ AMPS

The label shall be reflective, with all letters capitalized and having a minimum height of 13 mm (1/2 in.) in white on red background.

Exception No. 1: This requirement shall not apply to fire pump disconnecting means.

Exception No. 2: If the installation is in compliance with 230.90(A) Exception No. 3, the installation shall not be required to comply with 230.90(A)(1)(a). However, 230.90(A)(1)(b) may still apply.

Exception No. 3: If the available surface area of the enclosure is not sufficient for adherence this placard, a uniform surface immediately adjacent to the enclosure shall be deemed sufficient.

Informational Note No. 1: This placard shall not span lapped siding. However, the placard is permitted to be adhered to a stainless steel or galvanized metal plate that spans lapped siding.

Informational Note No. 2: This placard shall not overlay other critical enclosure information or labeling.

(b) Service Entrance Conductors

(i) Fuses.

CAUTION: SERVICE ENTRANCE CONDUCTOR RATING

IS LESS THAN ENCLOSURE RATING.

ENCLOSURE: _______ AMPS

MAX FUSE: _______ AMPS

(ii) Non-adjustable Trip Circuit Breakers.

CAUTION: SERVICE ENTRANCE CONDUCTOR RATING

IS LESS THAN ENCLOSURE RATING.

ENCLOSURE: _______ AMPS

MAX BREAKER: _______ AMPS

(iii) Adjustable-Trip Circuit Breakers.

CAUTION: SERVICE ENTRANCE CONDUCTOR RATING

IS LESS THAN ENCLOSURE RATING.

ENCLOSURE: _______ AMPS

MAX TIME DELAY TRIP: _______ AMPS

The label shall be reflective, with all letters capitalized and having a minimum height of 13 mm (1/2 in.) in white on red background.

Exception No. 1: This requirement shall not apply to fire pump disconnecting means.

Exception No. 2: If the available surface area of the enclosure is not sufficient for adherence of a placard, a uniform surface immediately adjacent to the enclosure shall be deemed sufficient.

Informational Note No. 1: This placard shall not span lapped siding. However, the placard is permitted to be adhered to a stainless steel or galvanized metal plate that spans lapped siding.

Informational Note No. 2: This placard shall not overlay other critical enclosure information or labeling.

Additional Proposed Changes

File Name	Description	Approved
NEC_230.90_A_Proposed_Changes.docx	NEC 230.90(A) Proposed Changes	

Statement of Problem and Substantiation for Public Input

250.90(A) Exception No. 3:

Most single-dwelling unit and small commercial services fall within the category of being less than or equal to 400 amps. Although 400 amps is arbitrary, it seems like a logical threshold for this proposal. These small systems do not have dedicated maintenance or engineering staff that review load calculations versus service ampacity when new loads are added. The control against overloading the service installation (including the service entrance conductors, self-contained meter enclosure, self-contained meter, service conductors, utility service wires and secondaries, etc.) is the sum of the overcurrent protective device(s).
Microgrid designers are moving loads from an existing main panel to a critical loads panel connected behind an additional service disconnect without upgrading the service installation. The result is one main service disconnect serving purely load and the microgrid main that serves the generation, battery energy storage system (BESS), and load. If the generation is not producing and the ESS has been exhausted, the result is purely load on the microgrid service disconnect. Many designers are not considering the load when the PV + BESS is off, and others are making the argument that they have calculated the loads, which allows for the sum of OCPDs to be greater than the various service installation components. From the utility perspective, the advent of microgrid systems, with a critical loads panel that is fed from an additional service disconnecting means interconnected on the supply side of the

main OCPD, has created a premise for egregiously exceeding the service installation rating. It is not uncommon to have an existing 200 A service, and the installer to add a second service disconnect rated for 100 A (feeding PV, BESS, and critical loads), without upgrading the 2/0 Cu service entrance conductors rated for 175 A. When the layman property owner decides to snap a breaker on the main distribution panel to feed a "do-it-yourself" project, the load calculation does not get re-examined.

Example: A one-family dwelling has an existing 200 A service installation, and the service entrance conductors are sized to be 2/0 Cu per Table 310.12(A). Per Table 310.16, 2/0 Cu is rated for 175 A without adjustment factors. The main breaker is permitted to be 200 A. Now the customer hires a designer to install solar with a battery ESS backup, which is a microgrid system with critical loads panel. The designer moves most loads to the critical loads panel (notable exceptions would be a heat pump AC unit and an electric water heater). The microgrid inverter is connected to a new service disconnect whose service conductors tap on the supply side of the existing main OCPD. The critical loads panel is connected downstream of the microgrid inverter. At night, the solar panels are not producing and the customer eventually exhausts his BESS. The result is purely load flowing from the point of interconnection to the critical loads panel, and a main distribution panel that could have the load added back in as a pool heater, mini split AC units, an on-demand electric water heater, etc. without utility knowledge. This could potentially overload the service entrance conductors, meter enclosure, meter, service conductors, and utility service wires and secondaries.

Additional requirements for article 705 Part II. Microgrid Systems may also be warranted.

230.90(A)(1) Labeling [New Section]

Although this proposal applies to all types of service installations (fire pumps not withstanding), it is most commonly seen with Interconnected Electric Power Production Sources. For these type projects, project designers often specify service conductors or service entrance conductors for the alternate energy source rated current per 705.28 with no additional capacity as it is not anticipated it will be needed in the future. Oftentimes, the service conductor and overcurrent protective device rating does not match the enclosure or bus rating. After the installer leaves the site, the layman owner has no knowledge that the overcurrent device rating or setting cannot be safely increased up to the enclosure rating.

Example: A 400 amp enclosure is installed with one run of 300 Cu (285 A) and 300 A fuses [per 240.4(B)]. The fuses melt, perhaps due to a mis-sizing of the installation for the total generation nameplate rating. The layman owner may think the fuse melting was a nuisance operation and replace the fuses with the max size that the fuse block will accept, 400 amp fuses, which would not properly protect the service conductors from overload. A permanent placard is needed to inform the owner of the maximum allowable overcurrent device rating/setting.

Submitter Information Verification

Submitter Full Name:	Clint Frederick
Organization:	Ameren Illinois
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Sep 06 21:14:06 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: The proposed changes are unnecessary. When the calculated loads do not exceed the rating of the service, in conjunction with complying with the applicable provisions of Article 705 for interconnection of power production systems, the submitter’s concerns are addressed. A threshold of 400A, as indicated by the submitter, is arbitrary. Additionally, an enclosure is not rated in amperes. The addition of a label would not resolve the issue of unqualified personnel performing electrical work.

NEC 230.90(A) Proposed Changes

Article 230 Part VII. Service Equipment --- Overcurrent Protection

230.90 Where Required.

(A) Ungrounded Conductor.

Exception No. 3: Two to six circuit breakers or sets of fuses shall be permitted as the overcurrent device to provide the overload protection. ~~The~~ If the sum of the ratings of the circuit breakers or fuses exceeds, but does not equal, 400 amps, they shall be permitted to exceed the ampacity of the service conductors, provided the calculated load does not exceed the ampacity of the service conductors.

N **(1) Labeling.** Each service disconnecting means with a supply conductor rating less than the enclosure rating shall be labeled with a permanent placard on the exterior of the enclosure that complies with one of the following:

(a) Service Conductors

(**i) Fuses.**

CAUTION: SERVICE CONDUCTOR RATING IS LESS THAN ENCLOSURE RATING.

ENCLOSURE: ______ AMPS

MAX FUSE: ______ AMPS

(ii) Non-adjustable Trip Circuit Breakers.

CAUTION: SERVICE CONDUCTOR RATING IS LESS THAN ENCLOSURE RATING.

ENCLOSURE: ______ AMPS

MAX BREAKER: ______ AMPS

(iii) Adjustable-Trip Circuit Breakers.

CAUTION: SERVICE CONDUCTOR RATING IS LESS THAN ENCLOSURE RATING.

ENCLOSURE: ______ AMPS

MAX TIME DELAY TRIP: ______ AMPS

The label shall be reflective, with all letters capitalized and having a minimum height of 13 mm (1/2 in.) in white on red background.

Exception No. 1: This requirement shall not apply to fire pump disconnecting means.

Exception No. 2: If the installation is in compliance with 230.90(A) Exception No. 3, the installation shall not be required to comply with 230.90(A)(1)(a). However, 230.90(A)(1)(b) may still apply.

Exception No. 3: If the available surface area of the enclosure is not sufficient for adhering this placard, a uniform surface immediately adjacent to the enclosure shall be deemed sufficient.

Informational Note No. 1: This placard shall not span lapped siding. However, the placard is permitted to be adhered to a stainless steel or galvanized metal plate that spans lapped siding.

Informational Note No. 2: This placard shall not overlay other critical enclosure information or labeling.

(b) Service Entrance Conductors

(**i) Fuses.**

CAUTION: SERVICE ENTRANCE CONDUCTOR RATING IS LESS THAN ENCLOSURE RATING.

ENCLOSURE: ______ AMPS

MAX FUSE: ______ AMPS

(ii) Non-adjustable Trip Circuit Breakers.

CAUTION: SERVICE ENTRANCE CONDUCTOR RATING IS LESS THAN ENCLOSURE RATING.

ENCLOSURE: ______ AMPS

MAX BREAKER: ______ AMPS

(iii) Adjustable-Trip Circuit Breakers.

CAUTION: SERVICE ENTRANCE CONDUCTOR RATING IS LESS THAN ENCLOSURE RATING.

ENCLOSURE: ______ AMPS

MAX TIME DELAY TRIP: ______ AMPS

The label shall be reflective, with all letters capitalized and having a minimum height of 13 mm (1/2 in.) in white on red background.

Exception No. 1: This requirement shall not apply to fire pump disconnecting means.

Exception No. 2: If the available surface area of the enclosure is not sufficient for adherence of a placard, a uniform surface immediately adjacent to the enclosure shall be deemed sufficient.

Informational Note No. 1: This placard shall not span lapped siding. However, the placard is permitted to be adhered to a stainless steel or galvanized metal plate that spans lapped siding.

Informational Note No. 2: This placard shall not overlay other critical enclosure information or labeling.

Justification:

250.90(A) Exception No. 3:

Most single-dwelling unit and small commercial services fall within the category of being less than or equal to 400 amps. Although 400 amps is arbitrary, it seems like a logical threshold for this proposal. These small systems do not have dedicated maintenance or engineering staff that review load calculations versus service ampacity when new loads are added. The control against overloading the service installation (including the service entrance conductors, self-contained meter enclosure, self-contained meter, service conductors, utility service wires and secondaries, etc.) is the sum of the overcurrent protective device(s).

Microgrid designers are moving loads from an existing main panel to a critical loads panel connected behind an additional service disconnect without upgrading the service installation. The result is one main service disconnect serving purely load and the microgrid main that serves the generation, battery energy storage system (BESS), and load. If the generation is not producing and the ESS has been exhausted, the result is purely load on the microgrid service disconnect. Many designers are not considering the load when the PV + BESS is off, and others are making the argument that they have calculated the loads, which allows for the sum of OCPDs to be greater than the various service installation components. From the utility perspective, the advent of microgrid systems, with a critical loads panel that is fed from an additional service disconnecting means interconnected on the supply side of the main OCPD, has created a premise for egregiously exceeding the service installation rating. It is not uncommon to have an existing 200 A service, and the installer to add a second service disconnect rated for 100 A (feeding PV, BESS, and critical loads), without upgrading the 2/0 Cu service entrance conductors rated for 175 A. When the layman property owner decides to snap a breaker on the main distribution panel to feed a "do-it-yourself" project, the load calculation does not get re-examined.

Example: A one-family dwelling has an existing 200 A service installation, and the service entrance conductors are sized to be 2/0 Cu per Table 310.12(A). Per Table 310.16, 2/0 Cu is rated for 175 A without adjustment factors. The main breaker is permitted to be 200 A. Now the customer hires a designer to install solar with a battery ESS backup, which is a microgrid system with critical loads panel. The designer moves most loads to the critical loads panel (notable exceptions would be a heat pump AC unit and an electric water heater). The microgrid inverter is connected to a new service disconnect whose service conductors tap on the supply side of the existing main OCPD. The critical loads panel is connected downstream of the microgrid inverter. At night, the solar panels are not producing and the customer eventually exhausts his BESS. The result is purely load flowing from the point of interconnection to the critical loads panel, and a main distribution panel that could have the load added back in as a pool heater, mini split AC units, an on-demand electric water heater, etc. without utility knowledge. This could potentially overload the service entrance conductors, meter enclosure, meter, service conductors, and utility service wires and secondaries.

Additional requirements for article 705 Part II. Microgrid Systems may also be warranted.

230.90(A)(1) Labeling [New Section]

Although this proposal applies to all types of service installations (fire pumps not withstanding), it is most commonly seen with Interconnected Electric Power Production Sources. For these type projects, project designers often specify service conductors or service entrance conductors for the alternate energy source rated current per 705.28 with no additional capacity as it is not anticipated it will be needed in the future. Oftentimes, the service conductor and overcurrent protective device does match the enclosure or bus rating. After the installer leaves the site, the layman owner has no knowledge that the overcurrent device rating or setting cannot be safely increased up to the enclosure rating.

Example: A 400 amp enclosure is installed with one run of 300 Cu (285 A) and 300 A fuses [per 240.4(B)]. The fuses melt, perhaps due to a mis-sizing of the installation for the total generation nameplate rating. The layman owner may think the fuse melting was a nuisance operation and replace the fuses with the max size that the fuse block will accept, 400 amp fuses, which would not properly protect the service conductors from overload. A permanent placard is needed to inform the owner of the maximum allowable overcurrent device rating/setting.

<u>**Related Proposed Changes**</u>:

Article 705 Part I. General

705.11 Source Connections to a Service.

(F) Overcurrent Protection. The power production source service conductors and service entrance conductors shall be protected from overcurrent in accordance with Part VII of Article 230. Labeling shall comply with 230.90(A)(1). The rating of the overcurrent device of the power production source service disconnecting means shall be used to determine if ground-fault protection of equipment is required in accordance with 230.95.

705.30 Marking. Equipment Containing overcurrent devices supplied from interconnected power sources shall be marked to indicate the presence of all sources and labeling shall comply with 230.90(A)(1).

Public Input No. 872-NFPA 70-2023 [Section No. 230.93]

~~**230.93** Protection of Specific Circuits.~~

~~Where necessary to prevent tampering, an automatic overcurrent device that protects service conductors supplying only a specific load, such as a water heater, shall be permitted to be locked or sealed where located so as to be accessible.~~

Statement of Problem and Substantiation for Public Input

Locked equipment is already considered accessible per 110.26(F).

Submitter Information Verification

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Submittal Date: Mon May 22 12:09:49 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: Although locked equipment may be considered accessible per 110.26(F), sealed equipment may require the use of a tool and is addressed by this section.

Public Input No. 4280-NFPA 70-2023 [Section No. 230.95]

230.95 Ground-Fault Protection of Equipment.

(A) AC Systems.

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 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.

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~~A)~~

B) DC Systems.

Ground-fault protection of equipment shall be provided for solidly grounded dc electric services of more than 150 volts to ground but not exceeding 1500 volts dc line-to-line for each service disconnect rated 1000 amperes or more. The grounded conductor for the solidly grounded dc 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.

(C) 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~~ D) 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~~ E) 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 could make it necessary to review the overall wiring system for proper selective overcurrent protection coordination. Additional installations of ground-fault protective equipment 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 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.

Statement of Problem and Substantiation for Public Input

This Public Input is submitted on behalf of a Correlating Committee DC Task Group consisting of Danish Zia, Jason Fisher, Randy Dollar, Larry Wildermuth, Scott Higgins, Scott Harding, Mark Earley, Jason Hopkins, Christopher Vance, Chad Kennedy and Derrick Atkins. This Public Input, along with other Public Inputs, was developed with the goal of improving usability and accuracy on requirements associated with DC circuits.

DC residential and commercial installations are emerging in the electrical infrastructure and are expected to be a growing alternative to the traditional AC only utility fed building. Examples include the US DOE Grid-interactive Efficient Buildings project (Note 1), the Purdue University RENEWW house (Note 2), and a DC Microgrid community in Vermont (Note 3). These installations may involve buildings that are distributed entirely with DC, or with an AC/DC hybrid distribution.

The requirements of Section 230.95 address ground-faults on equipment which could propagate into a larger arcing fault, potentially causing significant loss of property and life. However, the requirements of Section 230.95 and related sections are currently limited to solidly grounded wye AC circuits only. The hazards addressed by this type of protection also exist in grounded DC circuits, and a resulting arcing fault may be more severe due to a lack of zero cross-over in DC waveforms. As there is continued expansion of DC throughout the infrastructure it is necessary to ensure that the same level of protection is provided. This proposal closes a gap in the Code for DC circuits where similar hazards exist but ground-fault protection of equipment may not be provided.

Note 1 - https://www.energy.gov/sites/default/files/2020/09/f79/bto-geb-project-summary-093020.pdf
Note 2 - https://engineering.purdue.edu/ME/News/2022/purdue-house-runs-entirely-on-dc-power
Note 3 - https://www.efficiencyvermont.com/Media/Default/docs/white-papers/Energy_Resilience.pdf

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 4283-NFPA 70-2023 [Section No. 240.13]	
Public Input No. 4279-NFPA 70-2023 [Section No. 215.10]	
Public Input No. 4279-NFPA 70-2023 [Section No. 215.10]	
Public Input No. 4283-NFPA 70-2023 [Section No. 240.13]	

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Submittal Date: Thu Sep 07 09:21:55 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: FR-9176-NFPA 70-2024

Statement: The committee is including DC in 230.95 to ensure the hazards for arcing faults are also addressed in DC systems from 150V to ground up to 1500V line-to-line.

Public Input No. 1645-NFPA 70-2023 [Section No. 230.95 [Excluding any Sub-Sections]]

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 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 No. 1 : The ground-fault protection provisions of this section shall not apply to a service disconnect for a continuous industrial process where a nonorderly shutdown will introduce additional or increased hazards.

Exception No. 2: For fused disconnects, where the available fault current is 10,000 amperes or greater, at the fused disconnect, the ground-fault protection provisions of this section shall not apply if the fuses have a clearing time of 0.07 seconds or less at the lower of the calculated minimum available arcing current or 38% of the available fault current , or if the disconnect switch complies with Section 240.67(B)(1), 240.67(B)(3), or 240.67(B)(4). and is set to operate at the lower of the calculated minimum arcing current or 38% of the available fault current.

Exception No. 3: For circuit breakers, where the available fault current is 10,000 amperes or greater, at the circuit breaker, the ground-fault protection provisions of this section shall not apply if the circuit breaker complies with Section 240.87(B)(2), 240.87(B)(4), 240.87(B)(5), or 240.87(B)(6). and is set to operate at the lower of the calculated minimum arcing current or 38% of the available fault current.

Additional Proposed Changes

File Name	Description	Approved
230.95.docx	230.95	

Statement of Problem and Substantiation for Public Input

Substantiation

Executive Summary:

We can now accurately predict the minimum three-phase arcing current, along with the minimum sustainable line-to-ground arcing current, for an arcing ground fault. Knowing these currents, we can determine whether or not the arc energy reduction methods in proposed Exceptions 2 and 3 will operate at, or below, those levels. If they do operate at or below those levels, the equipment damage will be just a small percentage of that allowed by the GFPE requirements of 230.95. This applies to all available fault currents of 10,000 amperes or greater.

Background:

A requirement (230.95) for ground fault protection of equipment (GFPE) was added to the 1971 NEC® because 480/277 volt, solidly grounded wye services, protected by 1000 ampere and larger overcurrent protective devices, were burning down due to arcing ground faults. 208/120 volt services and those services protected by smaller overcurrent protective devices were not burning down, so they weren't included in the new GFPE requirement. Over many Code cycles, GFPE requirements were also added for branch circuits (210.13), feeders (215.10), and equipment (240.13). In all cases, the intent was to limit, not eliminate, damage to the switchboard, switchgear, panelboard or equipment being supplied by the 1000 ampere and larger overcurrent protective device.

Present Day:

The electrical industry has evolved considerably since those early GFPE requirements were introduced. In those years, J. R. Dunki-Jacobs, Harris I. Stanback, and R. H. Kaufman authored numerous ground-breaking papers on arcing ground faults and the need for ground fault protection. They accomplished a great deal and their determination that the minimum sustainable line-to-ground arcing fault on a 480/277 volt system was 38% of the available bolted fault current is very close to the values predicted today by IEEE1584-2019. In recent editions of the NEC®, Sections were added to require the protection of an employee that is exposed to dangerous levels of incident energy while working on energized equipment. To avoid serious injuries, employees, working on or near energized equipment, can only withstand a small fraction of the incident energy to which equipment may be subjected by the allowances of 230.95(A). This substantiation compares the levels of equipment damage allowed by existing 230.95(A) with the levels allowed by the employee arc-flash protection requirements of 240.67 and 240.87. It shows that the equipment damage allowed by the employee arc-flash protection requirements of 240.67 and 240.87 is just a small fraction of that allowed by 230.95(A).

The following examples utilize IEEE 1584-2018 for a 480 volt arcing fault with 32mm equipment spacing, in a 20”x20”x20” box and an HCB (horizontal conductors in a metal enclosure) configuration. Equipment damage is described in terms of kW-cycles which is a product of arcing current (kA) X number of arcing cycles (cycles) X arc voltage (100 volts on a 480 system).

Worst Case Equipment Damage with 10 kA Available Fault Current

As allowed by 230.95(A). The IEEE 1584-2018 minimum arcing current is 6.09kA. Using the maximum 230.95(A) opening time of 60 cycles, the equipment damage is (6.09 kA X 60 cycles X 100 arcing volts) = 36,540 kW-cycles. See Figure 1.

As allowed by Proposed Exception No. 2. The IEEE 1584-2018 minimum arcing current is 6.09kA. Assuming the maximum opening time of 4.2 cycles (0.07 seconds) for 240.67(B), the equipment damage is 6.09 kA X 4.2 cycles X 100 arcing volts) = 2,558 kW-cycles. Assuming an opening time of 7 cycles for 240.67(B)(1) and (B)(3), the equipment damage is (6.09 kA X 7 cycles X 100 arcing volts = 4,263 kW-cycles. Assuming an opening time of 1/2 cycle for 240.67(B)(4), the equipment damage is (6.09 kA X 0.5 cycles X 100 arcing volts) = 305 kW-cycles. Worst-case damage for the minimum arcing current with this proposed exception for fusible switches (4,263 kW-cycles) is less than 12% of the worst-case damage allowed by 230.95(A) (36,540 kW-cycles). See Figure 1.

As allowed by Proposed Exception No. 3. The IEEE 1584-2018 minimum arcing current is 6.09kA. Assuming an opening time of 4 cycles for 240.87(B)(1), (B)(2), or (B)(4), the equipment damage is (6.09 kA X 4.0 cycles X 100 arcing volts) = 2,436 kW-cycles. Assuming an opening time of 3 cycles for 240.87(B)(5) or (B)(6), the equipment damage is (6.09 kA X 3 cycles X 100 arcing volts) = 1,827 kW-cycles. Worst-case damage for the minimum arcing current with this proposed exception for circuit breakers (2,426 KW-Cycles) is less than 7% of the worst-case damage allowed by 230.95(A) (36,540 kW-cycles). See Figure 1.

Worst Case Equipment Damage with 25 kA Available Fault Current

As allowed by 230.95(A). The IEEE 1584-2018 minimum arcing current is 15.21kA. Using the maximum 230.95(A) opening time of 60 cycles, the equipment damage is (15.21 kA X 60 cycles X 100 arcing volts) = 91,260 kW-cycles. See Figure 1.

As allowed by Proposed Exception No. 2. The IEEE 1584-2018 minimum arcing current is 15.21kA. Assuming the maximum opening time of 4.2 cycles for 240.67(B), the equipment damage is (15.21 kA X 4.2 cycles X 100 arcing volts) = 6,388 kW-cycles. Assuming an opening time of 7 cycles for 240.67(B)(1) and (B)(3), the equipment damage is (15.21 kA X 7 cycles X 100 arcing volts) = 10,647 kW-cycles. Assuming an opening time of 1/2 cycle for 240.67(B)(4), the equipment damage is (15.21 kA X 0.5 cycles X 100 arcing volts) = 761 kW-cycles. Worst-case damage for the minimum arcing current with this proposed exception for fusible switches (10,647 kW-cycles) is less than 12% of the worst-case damage allowed by 230.95(A) (91,260 kW-cycles). See Figure 1.

As allowed by Proposed Exception No. 3. The IEEE 1584-2018 minimum arcing current is 15.21kA. Assuming an opening time of 4 cycles for 240.87(B)(1), (B)(2), or (B)(4), the equipment damage is (15.21 kA X 4 cycles X 100 arcing volts) = 6,084 kW-cycles. Assuming an opening time of 3 cycles for 240.87(B)(5) or (B)(6), the equipment damage is (15,21 kA X 3 cycles X 100 arcing volts) = 4,563 kW-cycles. Worst-case damage for the minimum arcing current with this proposed exception for circuit breakers (6,084 kW-Cycles) is less than 7% of the worst-case damage allowed by 230.95(A) (91,260 kW-cycles). See Figure 1.

Worst Case Equipment Damage with 50 kA Available Fault Current

As allowed by 230.95(A). The IEEE 1584-2018 minimum arcing current is 25.98kA. Using the maximum 230.95(A) opening time of 60 cycles, the equipment damage is (25.98 kA X 60 cycles X 100 arcing volts) = 155,880 kW-cycles. See Figure 1.
As allowed by Proposed Exception No. 2. The IEEE 1584-2018 minimum arcing current is 25.98kA. Assuming an opening time of 4.2 cycles for 240.67(B), the equipment damage is (25.98 kA X 4.2 cycles X 100 arcing volts) = 10,912 kW-cycles. Assuming an opening time of 7 cycles for 240.67(B)(1) and (B)(3), the equipment damage is (25.98 kA X 7 cycles X 100 arcing volts) = 18,186 kW-cycles. Assuming an opening time of 1/2 cycle for 240.67(B)(4), the equipment damage is (25.98 kA X 0.5 cycles X 100 arcing volts) = 1,299 kW-cycles. Worst-case damage for the minimum arcing current with this proposed exception for fusible switches (18,186 kW-cycles) is less than 12% of the worst-case damage allowed by 230.95(A) (155,880 kW-cycles). See Figure 1.

As allowed by Proposed Exception No. 3. The IEEE 1584-2018 minimum arcing current is 25.98kA. Assuming an opening time of 4 cycles for 240.87(B)(1), (B)(2), or (B)(4), the equipment damage is (25.98 kA X 4 cycles X 100 arcing volts) = 10,392 kW-cycles. Assuming an opening time of 3 cycles for 240.87(B)(5) or (B)(6), the equipment damage is (25.98 kA X 3 cycles X 100 arcing volts) = 7,794 kW-cycles. Worst-case damage for the minimum arcing current with this proposed exception for circuit breakers (10,392 KW-Cycles) is less than 7% of the worst-case damage allowed by 230.95(A) (155,880 kW-cycles). See Figure 1.

Worst Case Equipment Damage with 100 kA Available Fault Current

As allowed by 230.95(A). For an available fault current of 100kA, the IEEE 1584-2018 three phase minimum arcing current is 33.75 kA. Using the maximum 230.95(A) opening time of 60 cycles, the equipment damage is (33.75 kA X 60 cycles X 100 arcing volts) = 202,500 kW-cycles. See Figure 1.

As allowed by Proposed Exception No. 2. The IEEE 1584-2018 minimum arcing current is 33.75 kA. Assuming the maximum opening time of 4.2 cycles (0.07 seconds) for 240.67(B), the equipment damage is 33.75 kA X 4.2 cycles X 100 arcing volts) = 14,175 kW-cycles. Assuming an opening time of 7 cycles for 240.67(B)(1) and (B)(3), the equipment damage is (33.75 kA X 7 cycles X 100 arcing volts = 23625 kW-cycles. Assuming an opening time of 1/2 cycle for 240.67(B)(4), the equipment damage is (33.75 kA X 0.5 cycles X 100 arcing volts) = 1688 kW-cycles. Worst-case damage for the minimum arcing current with this proposed exception for fusible switches (23625 kW-cycles) is less than 12% of the worst-case damage allowed by 230.95(A) (202,500 kW-cycles). See Figure 1.

As allowed by Proposed Exception No. 3. For an available fault current of 100kA, the IEEE 1584-2018 minimum arcing current is 33.75 kA. Assuming an opening time of 4 cycles for 240.87(B)(1), (B)(2), or (B)(4), the equipment damage is (33.75 kA X 4.0 cycles X 100 arcing volts) = 13,500 kW-cycles. Assuming an opening time of 3 cycles for 240.87(B)(5) or (B)(6), the equipment damage is (33.75 kA X 3 cycles X 100 arcing volts) = 10,125 kW-cycles. Worst-case damage for the minimum arcing current with this proposed exception for circuit breakers (13,500 KW-Cycles) is less than 7% of the worst-case damage allowed by 230.95(A) (202,500 kW-cycles). See Figure 1

Figure 1 (See attached file)
Figures 1 it shows that equipment damage allowed by this Public Input is always, from 10,000 amperes available through 100,000 amperes available, just a small fraction of the equipment damage allowed by 230.95(A).

One might ask whether it is possible that the alternate systems proposed by this Public Input could be set such that they might provide arc energy reduction, but not operate during a lower level ground fault where traditional GFPE will provide protection. That question is answered by the very last lines of the proposed new language for both fusible switches and circuit breakers, as both the fusible switches and circuit breakers must be “set to operate at the lower of the calculated minimum arcing current or 38% of the available fault current.” Since we know the minimum three phase arcing current from IEEE 1584-2018 and the minimum sustainable phase to ground arcing current of 38% of the available fault current, we know whether or not the fusible switch or circuit breaker is set to operate at those values. So, there is no minimum value of actual arcing current that could be so small as to be picked up by 230.95(A) requirements that would not also be sensed by the requirements of Exceptions 2 and 3.

Let’s look at an example with 10,000 available short-circuit amperes (lowest available fault current for which Exceptions 2 and 3 could apply). In this case the minimum 1584-2018 three-phase arcing current is 6.09 kA and the minimum sustainable phase-to-ground current is 38% of 10,000 amps = 3.8 kA. Per the requirements of the proposed exceptions the fusible switch or circuit breaker must be set to operate at the lower of either 6.09 kA or 3.8 kA, so the fusible switch or circuit breaker must operate for arcing currents of 3.8 kA or greater. If a three phase arcing fault occurs it is calculated to be 6.09 kA with the possibility that a single phase to ground arcing fault could be as low as 3.8 kA. In either case, the requirements of Exceptions 2 and 3 assure that the arcing fault is taken off-line in no more than 7 cycles for Exception 2 and no more than 4 cycles for Exception 3, while 230.95(A) would allow a full 60 cycles.

What happens if the available fault current is less than or even significantly less than 10,000 amperes? Then the proposed Exceptions 2 and 3 do not apply and GFPE would be required.

Energy reducing maintenance switches (240.67(B)(2) and 240.87(B)(3)) are not included in the exceptions because energy-reducing maintenance switches are typically turned off when a worker is not working on energized equipment, whereas ground fault protection is constantly protecting the equipment, whether or not a worker is working on the energized equipment.

The Approved Equivalent Means (240.67(B)(5) and 240.87(B)(7)) are excluded because the opening times for these methods are unclear.

Key Benefit:

While GFPE can often be set as low as 200 amperes, because of numerous nuisance GFPE openings, in some cases even for ground faults in 277-volt lighting circuits, it has become common for plant electricians, plant engineers, consulting engineers, and electrical contractors to set GFPE at the maximum settings. That has solved a portion of the nuisance tripping problem, but even set at the maximum, it is often difficult to selectively coordinate it (GFPE) with feeder phase overcurrent protective devices of 400 amperes or greater. So, for example, even with a service GFPE set at the 230.95(A) maximum, a ground fault on a 500 kcmil feeder circuit will typically take out the GFPE on the service, blacking out the entire service. With Exceptions 2 and 3, the GFPE is no longer required. The equipment is still protected (even better protected) and the entire service is not subjected to a nuisance blackout because of a ground fault on a feeder. The key benefit of this Public Input is that when these alternate methods are utilized, it provides the consulting engineer or design-build contractor with the ability to provide even better arcing fault protection for the equipment and the ability to much more easily meet the selective coordination requirements of 240.11, 700.32, 701.32, and 708.54.

Conclusion:

This Public Input takes advantage of the arc-energy reduction requirements found in 240.67 and 240.87. It provides an exception for GFPE requirements whenever specific 240.67 and 240.87 methods to reduce clearing time are utilized. Arc energy reduction methods, as detailed in Exceptions 2 and 3, must open for “all” actual arcing ground faults and in a much faster time than allowed by 230.95(A). Reviewing Figure 1, it becomes obvious that Exceptions 2 and 3 will limit the arcing fault damage to the equipment to a level that is considerably less than that currently allowed by the requirements found in 230.95(A).

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Submittal Date: Thu Jul 27 16:09:22 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: Even with the limitations proposed in the new exceptions, the arc energy reduction technologies may not operate above the pickup current levels specified in 230.95(A), but below the minimum arcing current. Ground-fault currents may exist in this range, and the arc energy reduction technology may not operate on this current unless the resulting damage to equipment leads to a higher current arcing fault. Additionally, differential relaying and energy-reducing active arc-flash mitigation system options would not protect any downstream conductors or equipment, and only provide protection within the equipment boundary. This may ultimately reduce the level of protection currently provided by GFPE, or by a combination of GFPE and arc energy reduction technology, as applicable.

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 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 No1 : The ground-fault protection provisions of this section shall not apply to a service disconnect for a continuous industrial process where a nonorderly shutdown will introduce additional or increased hazards.

Exception No. 2: For fused disconnects, where the available fault current is 10,000 amperes or greater, at the fused disconnect, the ground-fault protection provisions of this section shall not apply if the fuses have a clearing time of 0.07 seconds or less at the lower of the calculated minimum available arcing current or 38% of the available fault current , or if the disconnect switch complies with Section 240.67(B)(1), 240.67(B)(3), or 240.67(B)(4). and is set to operate at the lower of the calculated minimum arcing current or 38% of the available fault current.

Exception No. 3: For circuit breakers, where the available fault current is 10,000 amperes or greater, at the circuit breaker, the ground-fault protection provisions of this section shall not apply if the circuit breaker complies with Section 240.87(B)(2), 240.87(B)(4), 240.87(B)(5), or 240.87(B)(6). and is set to operate at the lower of the calculated minimum arcing current or 38% of the available fault current.

Substantiation

Executive Summary: We can now accurately predict the minimum three-phase arcing current, along with the minimum sustainable line-to-ground arcing current, for an arcing ground fault. Knowing these currents, we can determine whether or not the arc energy reduction methods in proposed Exceptions 2 and 3 will operate at, or below, those levels. If they do operate at or below those levels, the equipment damage will be just a small percentage of that allowed by the GFPE requirements of 230.95. This applies to all available fault currents of 10,000 amperes or greater.

Background: A requirement (230.95) for ground fault protection of equipment (GFPE) was added to the 1971 NEC® because 480/277 volt, solidly grounded wye services, protected by 1000 ampere and larger overcurrent protective devices, were burning down due to arcing ground faults. 208/120 volt services and those services protected by smaller overcurrent protective devices were not burning down, so they weren't included in the new GFPE requirement. Over many Code cycles, GFPE requirements were also added for branch circuits (210.13), feeders (215.10), and equipment (240.13). In all cases, the intent was to limit, not eliminate, damage to the switchboard, switchgear, panelboard or equipment being supplied by the 1000 ampere and larger overcurrent protective device.

Present Day: The electrical industry has evolved considerably since those early GFPE requirements were introduced. In those years, J. R. Dunki-Jacobs, Harris I. Stanback, and R. H. Kaufman authored numerous ground-breaking papers on arcing ground faults and the need for ground fault protection. They accomplished a great deal and their determination that the minimum sustainable line-to-ground arcing fault on a 480/277 volt system was 38% of the available bolted fault current is very close to the values predicted today by IEEE1584-2019. In recent editions of the NEC®, Sections were added to require the protection of an employee that is exposed to dangerous levels of incident energy while working on energized equipment. To avoid serious injuries, employees, working on or near energized equipment, can only withstand a small fraction of the incident energy to which equipment may be subjected by the allowances of 230.95(A). This substantiation compares the levels of equipment damage allowed by existing 230.95(A) with the levels allowed by the employee arc-flash protection requirements of 240.67 and 240.87. It shows that the equipment damage allowed by the employee arc-flash protection requirements of 240.67 and 240.87 is just a small fraction of that allowed by 230.95(A). The following examples utilize IEEE 1584-2018 for a 480 volt arcing fault with 32mm equipment spacing, in a 20”x20”x20” box and an HCB (horizontal conductors in a metal enclosure) configuration. Equipment damage is described in terms of kW-cycles which is a product of arcing current (kA) X number of arcing cycles (cycles) X arc voltage (100 volts on a 480 system).

Worst Case Equipment Damage with 10 kA Available Fault Current

As allowed by 230.95(A). The IEEE 1584-2018 minimum arcing current is 6.09kA. Using the maximum 230.95(A) opening time of 60 cycles, the equipment damage is (6.09 kA X 60 cycles X 100 arcing volts) = 36,540 kW-cycles. See Figure 1.

As allowed by Proposed Exception No. 2. The IEEE 1584-2018 minimum arcing current is 6.09kA. Assuming the maximum opening time of 4.2 cycles (0.07 seconds) for 240.67(B), the equipment damage is 6.09 kA X 4.2 cycles X 100 arcing volts) = 2,558 kW-cycles. Assuming an opening time of 7 cycles for 240.67(B)(1) and (B)(3), the equipment damage is (6.09 kA X 7 cycles X 100 arcing volts = 4,263 kW-cycles. Assuming an opening time of 1/2 cycle for 240.67(B)(4), the equipment damage is (6.09 kA X 0.5 cycles X 100 arcing volts) = 305 kW-cycles. Worst-case damage for the minimum arcing current with this proposed exception for fusible switches (4,263 kW-cycles) is less than 12% of the worst-case damage allowed by 230.95(A) (36,540 kW-cycles). See Figure 1.

As allowed by Proposed Exception No. 3. The IEEE 1584-2018 minimum arcing current is 6.09kA. Assuming an opening time of 4 cycles for 240.87(B)(1), (B)(2), or (B)(4), the equipment damage is (6.09 kA X 4.0 cycles X 100 arcing volts) = 2,436 kW-cycles. Assuming an opening time of 3 cycles for 240.87(B)(5) or (B)(6), the equipment damage is (6.09 kA X 3 cycles X 100 arcing volts) = 1,827 kW-cycles. Worst-case damage for the minimum arcing current with this proposed exception for circuit breakers (2,426 KW-Cycles) is less than 7% of the worst-case damage allowed by 230.95(A) (36,540 kW-cycles). See Figure 1.

Worst Case Equipment Damage with 25 kA Available Fault Current

As allowed by 230.95(A). The IEEE 1584-2018 minimum arcing current is 15.21kA. Using the maximum 230.95(A) opening time of 60 cycles, the equipment damage is (15.21 kA X 60 cycles X 100 arcing volts) = 91,260 kW-cycles. See Figure 1.

As allowed by Proposed Exception No. 2. The IEEE 1584-2018 minimum arcing current is 15.21kA. Assuming the maximum opening time of 4.2 cycles for 240.67(B), the equipment damage is (15.21 kA X 4.2 cycles X 100 arcing volts) = 6,388 kW-cycles. Assuming an opening time of 7 cycles for 240.67(B)(1) and (B)(3), the equipment damage is (15.21 kA X 7 cycles X 100 arcing volts) = 10,647 kW-cycles. Assuming an opening time of 1/2 cycle for 240.67(B)(4), the equipment damage is (15.21 kA X 0.5 cycles X 100 arcing volts) = 761 kW-cycles. Worst-case damage for the minimum arcing current with this proposed exception for fusible switches (10,647 kW-cycles) is less than 12% of the worst-case damage allowed by 230.95(A) (91,260 kW-cycles). See Figure 1.

As allowed by Proposed Exception No. 3. The IEEE 1584-2018 minimum arcing current is 15.21kA. Assuming an opening time of 4 cycles for 240.87(B)(1), (B)(2), or (B)(4), the equipment damage is (15.21 kA X 4 cycles X 100 arcing volts) = 6,084 kW-cycles. Assuming an opening time of 3 cycles for 240.87(B)(5) or (B)(6), the equipment damage is (15,21 kA X 3 cycles X 100 arcing volts) = 4,563 kW-cycles. Worst-case damage for the minimum arcing current with this proposed exception for circuit breakers (6,084 kW-Cycles) is less than 7% of the worst-case damage allowed by 230.95(A) (91,260 kW-cycles). See Figure 1.

Worst Case Equipment Damage with 50 kA Available Fault Current

As allowed by 230.95(A). The IEEE 1584-2018 minimum arcing current is 25.98kA. Using the maximum 230.95(A) opening time of 60 cycles, the equipment damage is (25.98 kA X 60 cycles X 100 arcing volts) = 155,880 kW- cycles. See Figure 1.

As allowed by Proposed Exception No. 2. The IEEE 1584-2018 minimum arcing current is 25.98kA. Assuming an opening time of 4.2 cycles for 240.67(B), the equipment damage is (25.98 kA X 4.2 cycles X 100 arcing volts) = 10,912 kW-cycles. Assuming an opening time of 7 cycles for 240.67(B)(1) and (B)(3), the equipment damage is (25.98 kA X 7 cycles X 100 arcing volts) = 18,186 kW-cycles. Assuming an opening time of 1/2 cycle for 240.67(B)(4), the equipment damage is (25.98 kA X 0.5 cycles X 100 arcing volts) = 1,299 kW-cycles. Worst-case damage for the minimum arcing current with this proposed exception for fusible switches (18,186 kW-cycles) is less than 12% of the worst-case damage allowed by 230.95(A) (155,880 kW-cycles). See Figure 1.

As allowed by Proposed Exception No. 3. The IEEE 1584-2018 minimum arcing current is 25.98kA. Assuming an opening time of 4 cycles for 240.87(B)(1), (B)(2), or (B)(4), the equipment damage is (25.98 kA X 4 cycles X 100 arcing volts) = 10,392 kW-cycles. Assuming an opening time of 3 cycles for 240.87(B)(5) or (B)(6), the equipment damage is (25.98 kA X 3 cycles X 100 arcing volts) = 7,794 kW-cycles. Worst-case damage for the minimum arcing current with this proposed exception for circuit breakers (10,392 KW-Cycles) is less than 7% of the worst-case damage allowed by 230.95(A) (155,880 kW-cycles). See Figure 1.

Worst Case Equipment Damage with 100 kA Available Fault Current

As allowed by 230.95(A). For an available fault current of 100kA, the IEEE 1584-2018 three phase minimum arcing current is 33.75 kA. Using the maximum 230.95(A) opening time of 60 cycles, the equipment damage is (33.75 kA X 60 cycles X 100 arcing volts) = 202,500 kW-cycles. See Figure 1.

As allowed by Proposed Exception No. 2. The IEEE 1584-2018 minimum arcing current is 33.75 kA. Assuming the maximum opening time of 4.2 cycles (0.07 seconds) for 240.67(B), the equipment damage is 33.75 kA X 4.2 cycles X 100 arcing volts) = 14,175 kW-cycles. Assuming an opening time of 7 cycles for 240.67(B)(1) and (B)(3), the equipment damage is (33.75 kA X 7 cycles X 100 arcing volts = 23625 kW-cycles. Assuming an opening time of 1/2 cycle for 240.67(B)(4), the equipment damage is (33.75 kA X 0.5 cycles X 100 arcing volts) = 1688 kW-cycles. Worst-case damage for the minimum arcing current with this proposed exception for fusible switches (23625 kW-cycles) is less than 12% of the worst-case damage allowed by 230.95(A) (202,500 kW-cycles). See Figure 1.

As allowed by Proposed Exception No. 3. For an available fault current of 100kA, the IEEE 1584-2018 minimum arcing current is 33.75 kA. Assuming an opening time of 4 cycles for 240.87(B)(1), (B)(2), or (B)(4), the equipment damage is (33.75 kA X 4.0 cycles X 100 arcing volts) = 13,500 kW-cycles. Assuming an opening time of 3 cycles for 240.87(B)(5) or (B)(6), the equipment damage is (33.75 kA X 3 cycles X 100 arcing volts) = 10,125 kW-cycles. Worst-case damage for the minimum arcing current with this proposed exception for circuit breakers (13,500 KW-Cycles) is less than 7% of the worst-case damage allowed by 230.95(A) (202,500 kW-cycles). See Figure 1

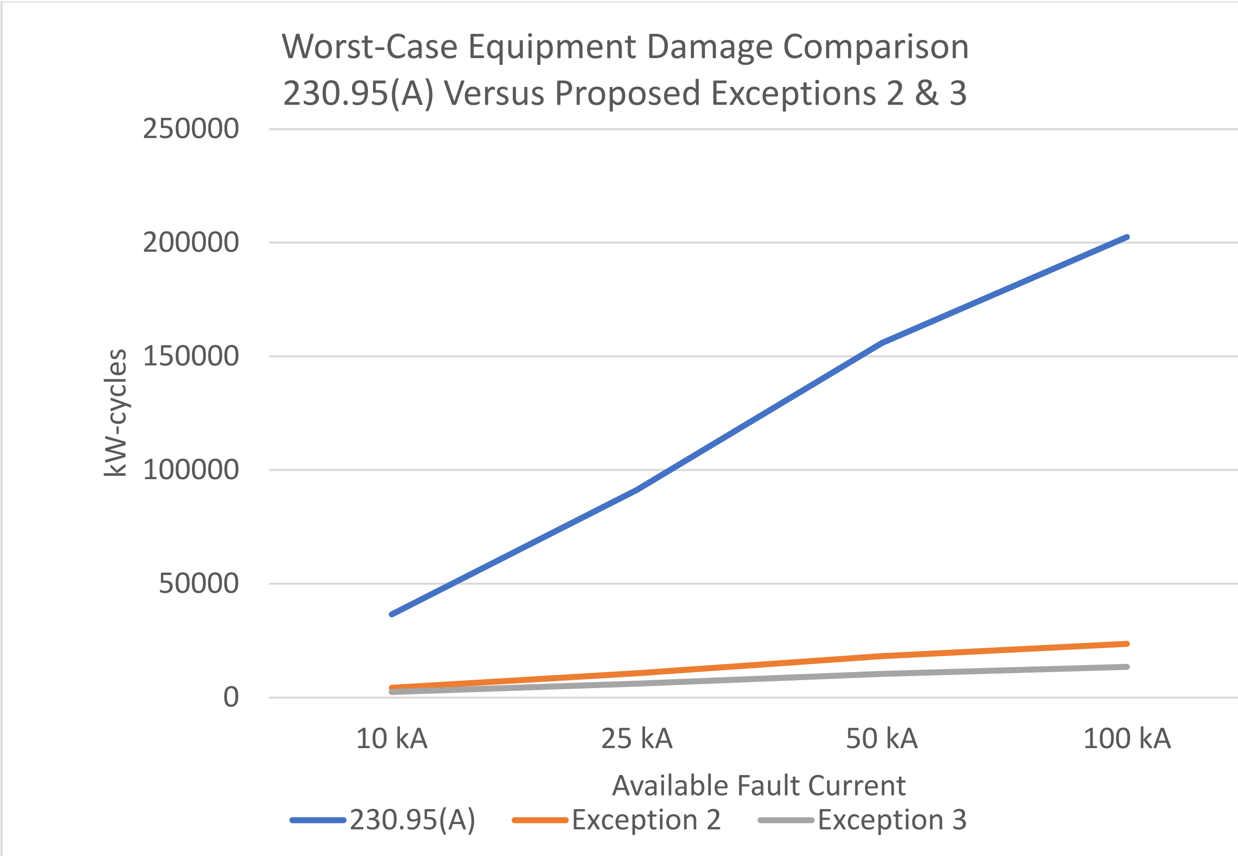

Figure 1

Figures 1 it shows that equipment damage allowed by this Public Input is always, from 10,000 amperes available through 100,000 amperes available, just a small fraction of the equipment damage allowed by 230.95(A).

One might ask whether it is possible that the alternate systems proposed by this Public Input could be set such that they might provide arc energy reduction, but not operate during a lower level ground fault where traditional GFPE will provide protection. That question is answered by the very last lines of the proposed new language for both fusible switches and circuit breakers, as both the fusible switches and circuit breakers must be ***"set to operate at the lower of the calculated minimum arcing current or 38% of the available fault current."*** Since we know the minimum three phase arcing current from IEEE 1584-2018 and the minimum sustainable phase to ground arcing current of 38% of the available fault current, we know whether or not the fusible switch or circuit breaker is set to operate at those values. So, there is no minimum value of actual arcing current that could be so small as to be picked up by 230.95(A) requirements that would not also be sensed by the requirements of Exceptions 2 and 3.

Let's look at an example with 10,000 available short-circuit amperes (lowest available fault current for which Exceptions 2 and 3 could apply). In this case the minimum 1584-2018 three-phase arcing current is 6.09 kA and the minimum sustainable phase-to-ground current is 38% of 10,000 amps = 3.8 kA. Per the requirements of the proposed exceptions the fusible switch or circuit breaker must be set to operate at the lower of either 6.09 kA or 3.8 kA, so the fusible switch or circuit breaker must operate for arcing currents of 3.8 kA or greater. If a three phase arcing fault occurs it is calculated to be 6.09 kA with the possibility that a single phase to ground arcing fault could be as low as 3.8 kA. In either case, the requirements of Exceptions 2 and 3 assure that the arcing fault is taken off-line in no more than 7 cycles for Exception 2 and no more than 4 cycles for Exception 3, while 230.95(A) would allow a full 60 cycles.

What happens if the available fault current is less than or even significantly less than 10,000 amperes? Then the proposed Exceptions 2 and 3 do not apply and GFPE would be required.

Energy reducing maintenance switches (240.67(B)(2) and 240.87(B)(3)) are not included in the exceptions because energy-reducing maintenance switches are typically turned off when a worker is not working on energized equipment, whereas ground fault protection is constantly protecting the equipment, whether or not a worker is working on the energized equipment.

The Approved Equivalent Means (240.67(B)(5) and 240.87(B)(7)) are excluded because the opening times for these methods are unclear.

Key Benefit: While GFPE can often be set as low as 200 amperes, because of numerous nuisance GFPE openings, in some cases even for ground faults in 277-volt lighting circuits, it has become common for plant electricians, plant engineers, consulting engineers, and electrical contractors to set GFPE at the maximum settings. That has solved a portion of the nuisance tripping problem, but even set at the maximum, it is often difficult to selectively coordinate it (GFPE) with feeder phase overcurrent protective devices of 400 amperes or greater. So, for example, even with a service GFPE set at the 230.95(A) maximum, a ground fault on a 500 kcmil feeder circuit will typically take out the GFPE on the service, blacking out the entire service. With Exceptions 2 and 3, the GFPE is no longer required. The equipment is still protected (even better protected) and the entire service is not subjected to a nuisance blackout because of a ground fault on a feeder. The key benefit of this Public Input is that when these alternate methods are utilized, it provides the consulting engineer or design-build contractor with the ability to provide even better arcing fault protection for the equipment and the ability to much more easily meet the selective coordination requirements of 240.11, 700.32, 701.32, and 708.54.

Conclusion: This Public Input takes advantage of the arc-energy reduction requirements found in 240.67 and 240.87. It provides an exception for GFPE requirements whenever specific 240.67 and 240.87 methods to reduce clearing time are utilized. Arc energy reduction methods, as detailed in Exceptions 2 and 3, must open for **“all”** actual arcing ground faults and in a much faster time than allowed by 230.95(A). Reviewing Figure 1, it becomes obvious that Exceptions 2 and 3 will limit the arcing fault damage to the equipment to a level that is considerably less than that currently allowed by the requirements found in 230.95(A).

Public Input No. 4027-NFPA 70-2023 [Section No. 230.95 [Excluding any Sub-Sections]]

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 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.

Statement of Problem and Substantiation for Public Input

This PI recommends the deletion of the second sentence for the following reasons: 1 - The grounding conductor is already required to be connected to the grounding electrode system. There is no need to repeat it here. 2 - The first sentence states that this section only pertains to solidly grounded systems. There is no need to repeat this by stating that it is not allowed to ground through an impedance device. 3 - 250.95 is referred to by 215.10 and 210.13. The Grounded conductors of 210 and 215 would not be connected to an electrode system. The author of this PI intended to combine all three sections and put them in Article 110. However, there do not seem to be any sections available in the appropriate Part of Article 110.

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Submittal Date: Wed Sep 06 14:25:05 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: Although the definition of solidly grounded specifies that no resistor impedance device shall be connected, the current language provides clarity for connection of GFPE.

Public Input No. 4368-NFPA 70-2023 [Section No. 240.1]

240.1 Scope.

Parts I through VII of this article provide the general requirements for overcurrent protection and overcurrent protective devices not more than 1000 volts, nominal. Part VIII covers overcurrent protection for those portions of supervised industrial installations operating at voltages of not more than 1000 volts, nominal.

Informational Note No. 1: Overcurrent protection for conductors and equipment is provided to open the circuit if the current reaches a value that will cause an excessive or dangerous temperature in conductors or conductor insulation.

Informational Note No. 2: See 110.9 for requirements for interrupting ratings and 110.10 for requirements for protection against fault currents.

Informational Note No. 3: Guidance about determining fault current may be found in IEEE 3002.3-2018Recommended Practice for Conducting Short-Circuit Studies and Analysis of Industrial and Commercial Power Systems

Statement of Problem and Substantiation for Public Input

This is another slice of updated content from the legacy "Red Book" IEEE 141 mapped into the new IEEE 3000 Standards Collection. From the project prospectus:

"Activities related to short-circuit analysis, including design considerations for new systems, analytical studies for existing systems, as well as operational and model validation considerations for industrial and commercial power systems are addressed. Fault current calculation and device duty evaluation is included in short-circuit analysis. Accuracy of calculation results primarily relies on system modeling assumptions and methods used. The use of computer-aided analysis software with a list of desirable capabilities recommended to conduct a modern short-circuit study is emphasized. Examples of system data requirements and result analysis techniques are presented."

https://standards.ieee.org/standard/3002_3-2018.html

This is one of two possible locations where this reference will improve the NEC.

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Committee: NEC-P10

Committee Statement

Resolution: The addition of the referenced IEEE standard does not improve usability. Per section 2.1.10 of the NEC Style Manual, Informational Notes shall be used sparingly.

Public Input No. 1318-NFPA 70-2023 [Section No. 240.2]

240.2 Reconditioned Equipment.

(A) ~~– Reconditioning~~ Not Permitted.

The following reconditioned equipment shall not be ~~reconditioned~~ permitted :

(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 reconditioned 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).

Statement of Problem and Substantiation for Public Input

This public input is a part of a series of public inputs that seeks to align the language found across the NEC pertaining to how reconditioned equipment is addressed in the NEC.

The following sections us the language that says “Reconditioned _____ shall not be permitted.” 404.16, 406.2, 408.2,410.2, 470.2, 495.2, 495.49,695.2,700.2,701.2,702.2,708.2,

This change suggests the appropriate way to address reconditioned equipment in the NEC. The NEC is an installation code governing the installation of solutions and in many locations throughout the NEC the solution is either permitted or not permitted. This suggested language would bring all references towards reconditioned equipment in alignment.

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Committee: NEC-P10

Committee Statement

Resolution: FR-9197-NFPA 70-2024

Statement: The text and numbering has been revised to comply with the NEC Style Manual section 2.2.1.

Public Input No. 1954-NFPA 70-2023 [Section No. 240.2]

240.~~2~~ 3 Reconditioned Equipment.

(A) ~~Reconditioning Not Permitted~~ Permitted to be Installed.

The following reconditioned equipment shall be permitted to be installed:

(1) Low-voltage power circuit breakers

(2) Electromechanical protective relays and current transformers

(B) Not Permitted to be Installed .

The following equipment shall not be permitted to be reconditioned or installed :

(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) .~~

Statement of Problem and Substantiation for Public Input

This revision changes the reconditioned section from 240.2 to 240.3 to comply with the NEC Style Manual Section 2.2.1. The previous text was revised to state what is permitted to be installed and not permitted to be installed to comply with the NEC Style Manual Section 2.2.1.

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Submittal Date: Tue Aug 08 14:13:55 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: FR-9197-NFPA 70-2024

Statement: The text and numbering has been revised to comply with the NEC Style Manual section 2.2.1.

Public Input No. 2599-NFPA 70-2023 [Section No. 240.2]

240. ~~2~~ **3** Reconditioned Equipment.

(A) ~~Reconditioning Not~~ **Permitted to be installed .**

The following reconditioned equipment

~~shall not be reconditioned~~
shall be permitted to be installed:

(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) .

(B) Not Permitted to be installed.

The following reconditioned equipment shall not be installed :

(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) .~~

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. The text is revised to comply with the NEC Style Manual Section 2.2.1 regarding reconditioned equipment.
2.2.1 Parallel Numbering Required. Technical committees shall use the following section numbers for the same purposes within articles. This requirement shall not apply to Articles 90, 100, and 110. If the article does not contain listing or reconditioning requirements, the subdivisions shall not be included in the article.
Required Parallel Numbering Format
XXX.1 Scope.
XXX.2 Listing Requirements.
XXX.3 Reconditioned Equipment.
XXX.3(A) Permitted to be Installed.
XXX.3(B) Not Permitted to be Installed.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

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Submittal Date: Wed Aug 23 19:25:17 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: FR-9197-NFPA 70-2024

Statement: The text and numbering has been revised to comply with the NEC Style Manual section 2.2.1.

Public Input No. 3692-NFPA 70-2023 [Section No. 240.2]

240.~~2~~ 3 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).

Statement of Problem and Substantiation for Public Input

The section should be moved to 240.3 for compliance with the NEC Style Manual Section 2.2.1.

Submitter Information Verification

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Submittal Date: Tue Sep 05 14:10:08 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9197-NFPA 70-2024

Statement: The text and numbering has been revised to comply with the NEC Style Manual section 2.2.1.

Public Input No. 3693-NFPA 70-2023 [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 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~~

Statement of Problem and Substantiation for Public Input

The Section is removed as the NEC is intended for use by qualified people. The information in 240.3 can be found by using the table of contents or the index. The section is also removed for compliance with the NEC Style Manual Section 2.2.1.

Submitter Information Verification

Submitter Full Name: Derrick Atkins
Organization: Minneapolis Electrical JATC
Street Address:
City:
State:
Zip:

Submittal Date: Tue Sep 05 14:11:18 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9201-NFPA 70-2024

Statement: The existing Section 240.3 is removed as the NEC is intended for use by qualified people. The information in 240.3 can be found by using the table of contents or the index. The section is also removed for compliance with the NEC Style Manual section 2.2.1.

Public Input No. 982-NFPA 70-2023 [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 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~~

Statement of Problem and Substantiation for Public Input

Section 4.1.4 of the NEC(r) Style Manual prohibits references to an entire article, with the exception of Article 100 or where necessary to provide context. There is a table of contents and an index in this document which can easily lead the user to the other articles found in the code and this table is not necessary as it does not provide a specific section or part of an article that we'd refer the user to. References to ~36 different articles in their entirety does not provide any usability improvement and thus I'd recommend deleting this table. Alternatively, if the panel wants to provide specific parts or sections instead, that would also be acceptable but many of these tables were deleted in the last cycle and that should certainly be considered here.

Submitter Information Verification

Submitter Full Name: Richard Holub

Organization: The DuPont Company, Inc.

Street Address:

City:

State:

Zip:

Submittal Date: Thu Jun 08 11:00:49 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: FR-9201-NFPA 70-2024

Statement: The existing Section 240.3 is removed as the NEC is intended for use by qualified people. The information in 240.3 can be found by using the table of contents or the index. The section is also removed for compliance with the NEC Style Manual section 2.2.1.

Public Input No. 649-NFPA 70-2023 [New Section after 240.4]

240.4 (G)

Single Phase Dwelling Services and Feeders as calculated in 310.12.

Statement of Problem and Substantiation for Public Input

Adding a new section to 240.4 (G) called "Single Phase Dwelling Services and Feeders as Calculated in 310.12" will correlate with the proposed change in 310.12 that refers the reader to 240.4 in order to permit conductors being protected less than shown in 240.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 648-NFPA 70-2023 [New Section after 310.12]	Supportive

Submitter Information Verification

Submitter Full Name: Gabe Kaprelian
Organization: [GK Electric
Street Address:
City:
State:
Zip:

Submittal Date: Mon Apr 17 16:06:35 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The existing 240.4(H) allows for dwelling unit service and feeder conductors to be protected at ampacity values in 310.12.

Public Input No. 705-NFPA 70-2023 [Section No. 240.4]

240.4 Protection of Conductors.

Conductors, other than flexible cords, flexible cables, and fixture wires, shall be protected against overcurrent in accordance with their ampacities specified in 310.14, unless otherwise permitted or required in 240.4(A) through (~~H~~ I).

Informational Note: See ICEA P-32-382-2018, *Short Circuit Characteristics of Insulated Cables*, for information on allowable short-circuit currents for insulated copper and aluminum conductors.

(A) Power Loss Hazard.

Conductor overload protection shall not be required where the interruption of the circuit would create a hazard, such as in a material-handling magnet circuit or fire pump circuit. Short-circuit protection shall be provided.

Informational Note: See NFPA 20-2019, *Standard for the Installation of Stationary Pumps for Fire Protection*.

(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.

If the overcurrent protective device is an adjustable trip deviceinstalled 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.

(C) Overcurrent Devices Rated over 800 Amperes.

Where the overcurrent device is rated over 800 amperes, the ampacity of the conductors it protects shall be equal to or greater than the rating of the overcurrent device defined in 240.6.

(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)(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:

 (3) Branch-circuit-rated circuit breakers listed and marked for use with 18 AWG copper conductor

 (4) Branch-circuit-rated fuses listed and marked for use with 18 AWG copper conductor

 (5) 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:

(3) <u>Branch-circuit-rated circuit breakers listed and marked for use with 16 AWG copper conductor</u>

(4) <u>Branch-circuit-rated fuses listed and marked for use with 16 AWG copper conductor</u>

(5) <u>Class CC, Class CF, Class J, or Class T fuses</u>

(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

(E) Tap Conductors.

Tap conductors shall be permitted to be protected against overcurrent in accordance with the following:

(1) 210.19(C) and (D), Household Ranges and Cooking Appliances and Other Loads

(2) 240.5(B)(2), Fixture Wire

(3) 240.21, Location in Circuit

(4) 368.17(B), Reduction in Ampacity Size of Busway

(5) 368.17(C), Feeder or Branch Circuits (busway taps)

(6) 430.53(D), Single Motor Taps

(F) Transformer Secondary Conductors.

Single-phase (other than 2-wire) and multiphase (other than delta-delta, 3-wire) transformer secondary conductors shall not be considered to be protected by the primary overcurrent protective device. Conductors supplied by the secondary side of a single-phase transformer having a 2-wire (single-voltage) secondary, or a three-phase, delta-delta connected transformer having a 3-wire (single-voltage) secondary, shall be permitted to be protected by overcurrent protection provided on the primary (supply) side of the transformer, provided this protection is in accordance with 450.3 and does not exceed the value determined by multiplying the secondary conductor ampacity by the secondary-to-primary transformer voltage ratio.

(G) Overcurrent Protection for Specific Conductor Applications.

Overcurrent protection for the specific conductors shall be permitted to be provided as referenced in Table 240.4(G).

Table 240.4(G) Specific Conductor Applications

Conductor	Article	Section
Air-conditioning and refrigeration equipment circuit conductors	440, Parts III, IV, VI	-
Capacitor circuit conductors	460	460.8(B) and 460.25
Control and instrumentation circuit conductors (Type ITC)	335	335.9
Electric welder circuit conductors	630	630.12 and 630.32
Fire alarm system circuit conductors	760	760.43, 760.45, 760.121, and Chapter 9, Tables 12(A) and 12(B)
Motor-operated appliance circuit conductors	422, Part II	-
Motor and motor-control circuit conductors	430, Parts II, III, IV, V, VI, VII	-
Phase converter supply conductors	455	455.7
Remote-control, signaling, and power-limited circuit conductors	725	724.43, 724.45, 725.60, and Chapter 9, Tables 11(A) and 11(B)
Secondary tie conductors	450	450.6

(H) Dwelling Unit Service and Feeder Conductors.

Dwelling unit service and feeder conductors shall be permitted to be protected against overcurrent at the ampacity values in 310.12.

(I) Neutral Conductors.

Neutral conductors sized according to their load calculated per 220.61 shall be permitted to be protected against overcurrent by the overcurrent protective devices for their associated ungrounded conductors.

Statement of Problem and Substantiation for Public Input

220.61 permits a neutral conductor's size to be reduced relative to its corresponding ungrounded circuit conductors, and this is common industry practice. However, 240.4 requires that circuit conductors be protected against overcurrent in accordance with their ampacity, and it currently provides no allowance for a reduced size neutral. As such this common industry practice is in violation of 240.4 as currently written. This change removes this presumably unintended oversight.

Submitter Information Verification

Submitter Full Name: Wayne Whitney
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Fri Apr 21 11:56:59 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The protection of grounded conductors is dependent on the protection of the ungrounded conductors as specified in section 240.22.

Public Input No. 1983-NFPA 70-2023 [Section No. 240.4(A)]

(A) Power Loss Hazard.

Conductor overload protection shall not be required where the interruption of the circuit would create a hazard~~, such as in a material-handling magnet circuit or fire pump circuit. Short~~ . Short -circuit protection shall be provided.

Informational Note: See NFPA 20-2019, *Standard for the Installation of Stationary Pumps for Fire Protection*.

Statement of Problem and Substantiation for Public Input

240.4 (A) – Text such as “material-handling magnet circuit or fire pump-circuit.” is more appropriate as an Informational Note than as enforceable code language. As an example, reference 250.52 (A) (2) Informational Note.

Submitter Information Verification

Submitter Full Name: Gary Hein
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 09 12:36:01 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9202-NFPA 70-2024

Statement: The examples are moved to Informational Note No. 2 in accordance with the NEC Style Manual section 2.1.10, as they improve usability of the associated requirement.

Public Input No. 1280-NFPA 70-2023 [Section No. 240.4(B)]

(B) Overcurrent Devices Rated ~~800 Amperes~~ 400 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.

If the overcurrent protective device is an adjustable trip deviceinstalled 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.

Statement of Problem and Substantiation for Public Input

Keeping the 800 amps or less in this section, contractor are running 500 MCM copper x 2 runs for 800 amps. According to the 75 degree chart that bring the total to 760 amps.
According to the UL list the conductors must be full size on services.

This section should be reduced to 400 amps

Submitter Information Verification

Submitter Full Name: John Plourde
Organization: City of Portsmouth NH
Affiliation: Performance Electrical training LLC.
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jul 05 16:09:49 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The proposal lacks clear technical substantiation in accordance with the NFPA Regulations Governing the Development of Standards section 4.3.4.1.

Public Input No. 3758-NFPA 70-2023 [Section No. 240.4(B)]

(B) Overcurrent Devices Rated 800 Amperes or Less.

(1) Next Higher Standard Rating. 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:

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

(b) 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).

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

(2) Adjustable Trip Device. If the overcurrent protective device is an adjustable trip ~~deviceinstalled~~ 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.

Statement of Problem and Substantiation for Public Input

Breaking up 240.4(B) into a list item format to facilitate understanding for Code users. In accordance with NFPA Style Manual section 3.5.1.2 additional subdivisions shall be used where multiple requirements can be broken into independent requirements.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Tue Sep 05 15:34:07 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The proposed revisions do not add clarity. Breaking the requirement into multiple parts could be confusing.

Public Input No. 706-NFPA 70-2023 [Section No. 240.4(G)]

(G) Overcurrent Protection for Specific Conductor Applications.

Overcurrent protection for the specific conductors shall be permitted to be provided as referenced in Table 240.4(G).

Table 240.4(G) Specific Conductor Applications

Conductor	Article	Section
Air-conditioning and refrigeration equipment circuit conductors	440, Parts III, IV, VI	-
Capacitor circuit conductors	460	460.8(B) and 460.25
Control and instrumentation circuit conductors (Type ITC)	335	335.9
Electric welder circuit conductors	630	630.12 and 630.32
Fire alarm system circuit conductors	760	760.43, 760.45, 760.121, and Chapter 9, Tables 12(A) and 12(B)
Motor-operated appliance circuit conductors	422, Part II	-
Motor and motor-control circuit conductors	430, Parts II, III, IV, V, VI, VII	-
Phase converter supply conductors	455	455.7
Remote-control, signaling, and power-limited circuit conductors	725	724.43, 724.45, 725.60, and Chapter 9, Tables 11(A) and 11(B)
Secondary tie conductors	450	450.6
Services	230	230.90(A)

Statement of Problem and Substantiation for Public Input

Article 230.90(A) Exception 3 permits multiple overcurrent devices to protect service conductors. Further "the sum of the ratings of the circuit breakers or fuses shall be permitted to exceed the ampacity of the service conductors, provided the calculated load does not exceed the ampacity of the service conductors."

So this is an allowable case in which conductors are not "protected against overcurrent in accordance with their ampacities." As such, it needs to be listed in 240.4 as one of the exceptions. Since this is a specific conductor application, listing it under 240.4(G) is appropriate.

Submitter Information Verification

Submitter Full Name: Wayne Whitney
Organization: [Not Specified]
Street Address:
City:
State:
Zip:

Submittal Date: Sun Apr 23 10:25:53 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The provisions of 230.90 pertain to overload protection for service conductors, not full overcurrent protection. Complying with Exception No. 3 of 230.90(A) is a form of protecting the service conductors from overloads.

Public Input No. 3614-NFPA 70-2023 [Section No. 240.4 [Excluding any Sub-Sections]]

Conductors, other than flexible cords, flexible cables, and fixture wires, shall be protected against overcurrent in accordance with their ampacities specified in 310.14, unless otherwise permitted or required in 240.4(A) through (H).

Exception: Remote-Control and Signaling circuit conductor ampacity shall not use ampacity adjustment or correction factors as part of the ampacity calculation.

Informational Note: See ICEA P-32-382-2018, *Short Circuit Characteristics of Insulated Cables*, for information on allowable short-circuit currents for insulated copper and aluminum conductors.

Statement of Problem and Substantiation for Public Input

Overcurrent protection is outside the scope of Article 300 and is covered by Article 240, Overcurrent Protection. Article 300 requirements cannot modify Article 240 requirements and any conflicts would be from Article 240. Section 300.26 (C) (3) (b)'s requirement for conductor ampacity to not utilize ampacity adjustment or correction factors as found in 310.14 has been relocated as an exception to 240.4 where it belongs. The TIA Addition to 300.26 was a relocation of remote-control and signaling conductor protection that was deleted from chapter 7 during a restructuring of Power-Limited articles and missed during the 2023 cycle. Moving it to Article 240 keeps a requirement that has been in place for many NEC editions and putting where it belongs.

240.1 Scope.
Parts I through VII of this article provide the general requirements for overcurrent protection and overcurrent protective devices not more than 1000 volts, nominal. Part VIII covers overcurrent protection for those portions of supervised industrial installations operating at voltages of not more than 1000 volts, nominal.

300.1 Scope.
(A) All Wiring Installations
This article covers general requirements for wiring methods and materials for all wiring installations unless modified by other articles in Chapter 3.
(B) Integral Parts of Equipment.
The requirements of this article are not intended to apply to the conductors that form an integral part of equipment, such as motors, controllers, motor control centers, or factory-assembled control equipment or listed utilization equipment.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3612-NFPA 70-2023 [Section No. 300.26(C)(3)]	This PI's deleted section is moved to 240.4

Submitter Information Verification

Submitter Full Name: Keith Waters
Organization: Schneider Electric
Street Address:
City:
State:
Zip:
Submittal Date: Tue Sep 05 08:07:09 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The language in 300.26(C)(3) concerns conductor ampacity and adjustment factors for non-power-limited remote-control and signaling circuits and should be included in the Article covering such circuits. Panel 10 requests the CC determine which Article addresses these circuits and assign the PI to the Panel having purview.

Public Input No. 635-NFPA 70-2023 [Section No. 240.4 [Excluding any Sub-Sections]]

~~Conductors~~ Circuit conductors , other than flexible cords, flexible cables, and fixture wires, shall be protected against overcurrent in accordance with their ampacities specified in 310.14, unless otherwise permitted or required in 240.4(A) through (H).

Informational Note: See ICEA P-32-382-2018, *Short Circuit Characteristics of Insulated Cables*, for information on allowable short-circuit currents for insulated copper and aluminum conductors.

Statement of Problem and Substantiation for Public Input

Overcurrent devices are not installed in equipment grounding conductors and other conductors that are not part of a circuit. So while obvious, that distinction should be made explicit.

Submitter Information Verification

Submitter Full Name: Wayne Whitney
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Sun Apr 16 13:44:06 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The proposed added language is unnecessary. The NEC already contains provisions for which types of conductors connect to overcurrent protection devices.

Public Input No. 837-NFPA 70-2023 [Section No. 240.5]

240.5 Protection of Flexible Cords, Flexible Cables, and ~~Fixture~~ Luminaire Wires.

Flexible cord and flexible cable, including tinsel cord and extension cords, and ~~fixture~~ luminaire wires shall be protected against overcurrent by either 240.5(A) or (B).

(A) Ampacities.

Flexible cord and flexible cable shall be protected by an overcurrent device in accordance with their ampacity as specified in Table 400.5(A)(1) and Table 400.5(A)(2). ~~Fixture~~ Luminaire wire shall be protected against overcurrent in accordance with its ampacity as specified in Table 402.5. Supplementary overcurrent protection, as covered in 240.10, shall be permitted to be an acceptable means for providing this protection.

(B) Branch-Circuit Overcurrent Device.

Flexible cord shall be protected, where supplied by a branch circuit, in accordance with one of the methods described in 240.5(B)(1), (B)(3), or (B)(4). ~~Fixture~~ Luminaire wire shall be protected, where supplied by a branch circuit, in accordance with 240.5(B)(2).

(1) Supply Cord of Listed Appliance or Luminaire.

Where flexible cord or tinsel cord is approved for and used with a specific listed appliance or luminaire, it shall be considered to be protected when applied within the appliance or luminaire listing requirements. For the purposes of this section, a luminaire may be either portable or permanent.

(2) ~~Fixture~~ Luminaire Wire.

~~Fixture~~ Luminaire wire shall be permitted to be tapped to the branch-circuit conductor of a branch circuit in accordance with the following:

(1) 15- or 20-ampere circuits — 18 AWG, up to 15 m (50 ft) of run length

(2) 15- or 20-ampere circuits — 16 AWG, up to 30 m (100 ft) of run length

(3) 20-ampere circuits — 14 AWG and larger

(4) 30-ampere circuits — 14 AWG and larger

(5) 40-ampere circuits — 12 AWG and larger

(6) 50-ampere circuits — 12 AWG and larger

(3) Extension Cord Sets.

Flexible cord used in listed extension cord sets shall be considered to be protected when applied within the extension cord listing requirements.

(4) Field Assembled Extension Cord Sets.

Flexible cord used in extension cords made with separately listed and installed components shall be permitted to be supplied by a branch circuit in accordance with the following:

20-ampere circuits — 16 AWG and larger

Statement of Problem and Substantiation for Public Input

In Article 410 and throughout the NEC, the word "Luminaire" has replaced the word "Fixture" except in Article 402 Fixture Wires and Section 240.5. I propose that a change of the wording "Fixture Wires" be done and switched to "Luminaire Wires" to keep continuity between the other articles.
(See Public Input No. 836-NFPA 70-2023 for more details)

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 836-NFPA 70-2023 [Article 402]	

Submitter Information Verification

Submitter Full Name: Andrew Kearns
Organization: Elight Electric Services
Street Address:
City:
State:
Zip:
Submittal Date: Tue May 16 21:36:50 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The current terminology used in Article 402 is “fixture wires”. The language can be revisited if Panel 6 revises the terminology to use “luminaire wires”.

Public Input No. 2087-NFPA 70-2023 [Section No. 240.5 [Excluding any Sub-Sections]]

Flexible cord and flexible cable, including tinsel cord and ~~extension cords~~ cord sets , and fixture wires shall be protected against overcurrent by either 240.5(A) or (B).

Statement of Problem and Substantiation for Public Input

The term ‘extension cords’ is not defined. Adding the word ‘cord sets’ to make the text technically correct. The term ‘cord set’ is an NEC Article 100 defined term. This proposed revision will enhance usability throughout the NEC.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:

Submittal Date: Fri Aug 11 15:49:15 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9208-NFPA 70-2024

Statement: The proposed change is necessary to align with the defined term “cord sets.”

The overcurrent protection reference to 240.5(A) or (B) was revised to comply with the NEC Style Manual section 4.1.3.

Public Input No. 4060-NFPA 70-2023 [Sections 240.6(B), 240.6(C), 240.6(D)]

Sections 240.6(B), 240.6(C), 240.6(D)

(B) Adjustable-Trip Circuit Breakers.

The rating of adjustable-trip circuit breakers having external means for adjusting the current setting (long-time pickup setting)~~, not meeting the requirements of~~ shall be the maximum setting possible unless otherwise permitted in 240.6(C) ~~, shall be the maximum setting possible.~~ or 240.6(D).

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

A circuit breaker(s) that cannot be adjusted remotely to modify the current setting and 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.

(D) Remotely Accessible Adjustable-Trip Circuit Breakers.

A circuit breaker(s) that can be adjusted remotely to modify the ~~adjusting means~~ current setting 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~~ only when local restricted access to the circuit breaker is achieved by 240.6(C)(1), (C)(2), (C)(3) or (C)(4), and remote access is 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:

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

(4) 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.

Statement of Problem and Substantiation for Public Input

The current wording in 240.6(B), (C) and (D) is not clear to the user as to when each requirement is applicable and 240.6(B) presently only refers to 240.6(C). This revision clarifies 240.6(B) to make it clear that a rating equivalent to the adjusted current setting may be achieved per 240.6(C) if the circuit breaker cannot be adjusted remotely, or per 240.6(D) if the circuit breaker can be adjusted remotely. Since circuit breakers that can be adjusted remotely to modify the current settings can also be adjusted locally, a requirement is added in 240.6(D) to clarify that physical restriction is still necessary per 240.6(C)(1) through 240.6(C)(4).

Additionally, a correction is applied to existing language in 240.6(D) to clarify that the current setting, not adjusting means, is adjusted remotely.

Lastly, a correction is applied to Informational Note No. 2 as the examples listed are not examples of “commissioning certification”.

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Submittal Date: Wed Sep 06 15:18:07 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9210-NFPA 70-2024

Statement: The revisions to 240.6(B), 240.6(C) and 240.6(D) provide clarity as to the applicability of the requirements for adjustable circuit breakers which may have local or remotely accessible adjusting means.

The additional Informational Note No. 4 for 240.6(D) helps provide guidance related to cyber-security of an electrical system. Informational Note No. 4 is being updated with the current edition of NEMA CY70001 in accordance with Section 3.3.6.2 of the Regulations Governing the Development of NFPA Standards.

Public Input No. 431-NFPA 70-2023 [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) <u>Setting must be visible without removing a dead front and exposing electrical connections</u>

(3) Located behind bolted equipment enclosure doors

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

(5) 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.

Statement of Problem and Substantiation for Public Input

One-lines and arc-flash studies should be revisited on a periodic basis to ensure accuracy, so that workers know what the proper PPE is before opening the panels. Without being able to see the settings, the one-lines and incident energy studies cannot be updated unless the covers are removed.

Submitter Information Verification

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Submittal Date: Sun Mar 05 10:48:27 EST 2023
Committee: NEC-P10

Committee Statement

Resolution: Placing restrictions on the manufacturing industry for the purpose of allowing someone to update facility line diagrams, is considered too restrictive.

Public Input No. 1231-NFPA 70-2023 [Section No. 240.6(D)]

(D) Remotely Accessible Adjustable-Trip Circuit Breakers.

A circuit breaker(s) that 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~~ both of the following ~~methods~~ :

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

(4) 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~~ and NIST *Framework for Improving Critical Infrastructure Cybersecurity*, Version 1.1 for examples of identification and 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~~

(4)

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.

Statement of Problem and Substantiation for Public Input

Existing requirements have no teeth. They allow for the installation to be vulnerable to cyber hacking by simply performing an assessment. That assessment, unfortunately, could actually show the system to be vulnerable to cyber attack. The major change of this Public Input removes that possible vulnerability. It requires a "networked" circuit breaker and associated hardware to be both "identified" for cybersecurity and for an "assessment" to be completed.

Why is it so important to require actual cyber security protection? Because, if the system is not protected, a hacker could easily reduce the ampere rating of the circuit breaker, forcing it to trip under normal running conditions. But the alternate source, possibly an emergency generator, will kick in, right? But the hacker could reduce the rating of the circuit breaker fed from that source too. In short, a hacker, whether foreign or domestic, could easily shut down any facility with network connected circuit breakers that are not protected. A cyber security assessment showing an unprotected system that sits in the plant engineer's desk drawer will not prevent the unplanned blackout of the facility.

Informational Note No. 1 adds "identification" to "assessment requirements" for possible standards which could be utilized.

"Manufacturer certification" is removed because it is not needed as nationally recognized testing laboratories are available for "commissioning certification" and "identification" of the circuit breaker and associated hardware.

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Submittal Date: Wed Jun 28 15:16:47 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: Facility owners have the responsibility to ensure that their electrical system is protected against cyber-attacks. Complying with one of the methods in 240.6(D)(2) establishes a minimum baseline for cybersecurity protection. The proposed changes are unnecessary.

Public Input No. 3426-NFPA 70-2023 [Section No. 240.6(D)]

(D) Remotely Accessible Adjustable-Trip Circuit Breakers.

A circuit breaker(s) that 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:

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

(4) 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.

Informational Note No. 4: See NEMA *CY10000 Cybersecurity Implementation Guidance for Connected Electrical Infrastructure* , for recommendations on how to meet this requirement.

Statement of Problem and Substantiation for Public Input

The cybersecurity evaluation requirements for connected circuit breakers does not currently provide recommendations on how to
confirm the evaluation of these products cybersecurity. The NEMA document provides the user with guidance on how to meet these requirements and others.

Submitter Information Verification

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Submittal Date: Sat Sep 02 19:35:54 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9210-NFPA 70-2024

Statement: The revisions to 240.6(B), 240.6(C) and 240.6(D) provide clarity as to the applicability of the requirements for adjustable circuit breakers which may have local or remotely accessible adjusting means.

The additional Informational Note No. 4 for 240.6(D) helps provide guidance related to cyber-security of an electrical system. Informational Note No. 4 is being updated with the current edition of NEMA CY70001 in accordance with Section 3.3.6.2 of the Regulations Governing the Development of NFPA Standards.

Public Input No. 4445-NFPA 70-2023 [Section No. 240.6(D)]

(D) Remotely Accessible Adjustable-Trip Circuit Breakers.

A circuit breaker(s) that 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:~~

(3) ~~The circuit breaker and associated software for adjusting the settings are identified as being evaluated for cybersecurity.~~

(4) ~~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.~~

Where required by governing laws, codes, or standards, cybersecurity shall be addressed in the Electrical Maintenance Plan defined in NFPA 70B.

No minimum cybersecurity level shall be required for systems that meet both of the following conditions:

(1) No network connectable equipment

(2) No uploadable software configuration

Statement of Problem and Substantiation for Public Input

NFPA 72 has leapt ahead of the NEC in definition of Cybersecurity requirements and best practices. NFPA 72 has the benefit of being a combined maintenance and installation standard, but the NEC does not have this luxury. All meaningful requirements around Cybersecurity are best addressed, and in many cases, only addressable as a maintenance issue as threats arise long after final inspection of a building. To this end, I will submit public inputs to NFPA 70B in the current cycle to establish a Cybersecurity chapter in line with NFPA 72's 2025 edition.

In support of this, I have proposed in this PI a change to the criteria exempting a device from cybersecurity evaluation to be in line with NFPA 72 and industry best practice. A "local nonnetworked interface" is still prone to cyber attack through malicious software updates applied by personnel physically present at the site, possibly without their knowledge due to breaks in the chain of trust around software update distribution systems. The NFPA 72 language addresses this vulnerability.

I have also proposed elimination of the installation-time requirement for listing or evaluation. The listing and evaluation status of equipment must be reevaluated over time at regular intervals, as described in NFPA 72's 2025

Second Draft. The NEC lacks the purview to enforce this effectively, but NFPA 70B does. Further, with NFPA 70B being elevated from recommendation to standard, it becomes more widely enforceable to address this critical issue.

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Committee:	NEC-P10

Committee Statement

Resolution: The proposed changes violate sections 3.2.1 and 4.2 of the NEC Style Manual. Additionally, requirements for cybersecurity protection do not presently exist in NFPA 70B.

Public Input No. 3689-NFPA 70-2023 [Section No. 240.7]

240.~~7~~ 2 Listing Requirements.

The following shall be listed:

(1) Branch-circuit overcurrent protective devices

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

(3) Ground-fault circuit interrupter devices

(4) Fuse reducers

Statement of Problem and Substantiation for Public Input

The section should be moved to 240.2 for compliance with the NEC Style Manual Section 2.2.1. Fuse reducers was added to the list as a relocation of the requirement from 240.60 for compliance with the NEC Style Manual Section 2.2.1.

Submitter Information Verification

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Submittal Date: Tue Sep 05 14:05:03 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9211-NFPA 70-2024

Statement: The existing Section 240.7 is moved to 240.2 for compliance with the NEC Style Manual Section 2.2.1. Fuse reducers are added to the list as a relocation of the requirement from 240.60 for compliance with the NEC Style Manual Section 2.2.1.

Additionally, fuse reducers are moved from 240.60(E) to 240.2(4) for compliance with the NEC Style Manual Section 2.2.1.

Public Input No. 1655-NFPA 70-2023 [Section No. 240.13]

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

(4) **For fused disconnects, where the available fault current, at the fused disconnect, is 10,000 amperes or greater, if the fuses have a clearing time of 0.07 seconds or less at the lower of the calculated minimum available arcing current or 38% of the available fault current, or if the disconnect switch complies with Section 240.67(B)(1), 240.67(B)(3),or 240.67(B)(4). and is set to operate at the lower of the calculated minimum arcing current or 38% of the available fault current.**

(5) **For circuit breakers, where the available fault current, at the circuit breaker, is 10,000 amperes or greater, if the circuit breaker complies with Section 240.87(B)(2), 240.87(B)(4),240.87(B)(5), or 240.87(B)(6). and is set to operate at the lower of the calculated minimum arcing current or 38% of the available fault current.**

Additional Proposed Changes

File Name	Description	Approved
240.13.docx	240.13	

Statement of Problem and Substantiation for Public Input

Substantiation

Executive Summary:

We can now accurately predict the minimum three-phase arcing current, along with the minimum sustainable line-to-ground arcing current, for an arcing ground fault. Knowing these currents, we can determine whether or not the arc energy reduction methods in proposed List Items 4 and 5 will operate at, or below, those levels. If they do operate at or below those levels, the equipment damage will be just a small percentage of that allowed by the GFPE requirements of 230.95. This applies to all available fault currents of 10,000 amperes or greater.

Background:

A requirement (230.95) for ground fault protection of equipment (GFPE) was added to the 1971 NEC® because 480/277 volt, solidly grounded wye services, protected by 1000 ampere and larger overcurrent protective devices, were burning down due to arcing ground faults. 208/120 volt services and those services protected by smaller overcurrent protective devices were not burning down, so they weren't included in the new GFPE requirement. Over many Code cycles, GFPE requirements were also added for branch circuits (210.13), feeders (215.10), and equipment (240.13). In all cases, the intent was to limit, not eliminate, damage to the switchboard, switchgear, panelboard or equipment being supplied by the 1000 ampere and larger overcurrent protective device.

Present Day:

The electrical industry has evolved considerably since those early GFPE requirements were introduced. In those years, J. R. Dunki-Jacobs, Harris I. Stanback, and R. H. Kaufman authored numerous ground-breaking papers on arcing ground faults and the need for ground fault protection. They accomplished a great deal and their determination that the minimum sustainable line-to-ground arcing fault on a 480/277 volt system was 38% of the available bolted fault current is very close to the values predicted today by IEEE1584-2019. In recent editions of the NEC®, Sections were added to require the protection of an employee that is exposed to dangerous levels of incident energy while working on energized equipment. To avoid serious injuries, employees, working on or near energized equipment, can only withstand a small fraction of the incident energy to which equipment may be subjected by the allowances of 230.95(A). This substantiation compares the levels of equipment damage allowed by existing 230.95(A) with the levels allowed by the employee arc-flash protection requirements of 240.67 and 240.87. It shows that the equipment damage allowed by the employee arc-flash protection requirements of 240.67 and 240.87 is just a small fraction of that allowed by 230.95(A).

The following examples utilize IEEE 1584-2018 for a 480 volt arcing fault with 32mm equipment spacing, in a 20"x20"x20" box and an HCB (horizontal conductors in a metal enclosure) configuration. Equipment damage is described in terms of kW-cycles which is a product of arcing current (kA) X number of arcing cycles (cycles) X arc voltage (100 volts on a 480 system).

Worst Case Equipment Damage with 10 kA Available Fault Current

As allowed by 230.95(A). The IEEE 1584-2018 minimum arcing current is 6.09kA. Using the maximum 230.95(A) opening time of 60 cycles, the equipment damage is (6.09 kA X 60 cycles X 100 arcing volts) = 36,540 kW-cycles. See Figure 1.

As allowed by Proposed List Item 4. The IEEE 1584-2018 minimum arcing current is 6.09kA. Assuming the maximum opening time of 4.2 cycles (0.07 seconds) for 240.67(B), the equipment damage is 6.09 kA X 4.2 cycles X 100 arcing volts) = 2,558 kW-cycles. Assuming an opening time of 7 cycles for 240.67(B)(1) and (B)(3), the equipment damage is (6.09 kA X 7 cycles X 100 arcing volts = 4,263 kW-cycles. Assuming an opening time of 1/2 cycle for 240.67(B)(4), the equipment damage is (6.09 kA X 0.5 cycles X 100 arcing volts) = 305 kW-cycles. Worst-case damage for the minimum arcing current with this proposed List Item for fusible switches (4,263 kW-cycles) is less than 12% of the worst-case damage allowed by 230.95(A) (36,540 kW-cycles). See Figure 1.

As allowed by Proposed List Item 5. The IEEE 1584-2018 minimum arcing current is 6.09kA. Assuming an opening time of 4 cycles for 240.87(B)(1), (B)(2), or (B)(4), the equipment damage is (6.09 kA X 4.0 cycles X 100 arcing volts) = 2,436 kW-cycles. Assuming an opening time of 3 cycles for 240.87(B)(5) or (B)(6), the equipment damage is (6.09 kA X 3 cycles X 100 arcing volts) = 1,827 kW-cycles. Worst-case damage for the minimum arcing current with this proposed List Item for circuit breakers (2,426 KW-Cycles) is less than 7% of the worst-case damage allowed by 230.95(A) (36,540 kW-cycles). See Figure 1.

Worst Case Equipment Damage with 25 kA Available Fault Current

As allowed by 230.95(A). The IEEE 1584-2018 minimum arcing current is 15.21kA. Using the maximum 230.95(A) opening time of 60 cycles, the equipment damage is (15.21 kA X 60 cycles X 100 arcing volts) = 91,260 kW-cycles. See Figure 1.

As allowed by Proposed List Item 4. The IEEE 1584-2018 minimum arcing current is 15.21kA. Assuming the maximum opening time of 4.2 cycles for 240.67(B), the equipment damage is (15.21 kA X 4.2 cycles X 100 arcing volts) = 6,388 kW-cycles. Assuming an opening time of 7 cycles for 240.67(B)(1) and (B)(3), the equipment damage is (15.21 kA X 7 cycles X 100 arcing volts) = 10,647 kW-cycles. Assuming an opening time of 1/2 cycle for 240.67(B)(4), the equipment damage is (15.21 kA X 0.5 cycles X 100 arcing volts) = 761 kW-cycles. Worst-case damage for the minimum arcing current with this proposed List Item for fusible switches (10,647 kW-cycles) is less than 12% of the worst-case damage allowed by 230.95(A) (91,260 kW-cycles). See Figure 1.

As allowed by Proposed List Item 5. The IEEE 1584-2018 minimum arcing current is 15.21kA. Assuming an opening time of 4 cycles for 240.87(B)(1), (B)(2), or (B)(4), the equipment damage is (15.21 kA X 4 cycles X 100 arcing volts) = 6,084 kW-cycles. Assuming an opening time of 3 cycles for 240.87(B)(5) or (B)(6), the equipment damage is (15,21 kA X 3 cycles X 100 arcing volts) = 4,563 kW-cycles. Worst-case damage for the minimum arcing current with this proposed List Item for circuit breakers (6,084 kW-Cycles) is less than 7% of the worst-case damage allowed by 230.95(A) (91,260 kW-cycles). See Figure 1.

Worst Case Equipment Damage with 50 kA Available Fault Current

As allowed by 230.95(A). The IEEE 1584-2018 minimum arcing current is 25.98kA. Using the maximum 230.95(A) opening time of 60 cycles, the equipment damage is (25.98 kA X 60 cycles X 100 arcing volts) = 155,880 kW-cycles. See Figure 1.

As allowed by Proposed List Item 4. The IEEE 1584-2018 minimum arcing current is 25.98kA. Assuming an opening time of 4.2 cycles for 240.67(B), the equipment damage is (25.98 kA X 4.2 cycles X 100 arcing volts) = 10,912 kW-cycles. Assuming an opening time of 7 cycles for 240.67(B)(1) and (B)(3), the equipment damage is (25.98 kA X 7 cycles X 100 arcing volts) = 18,186 kW-cycles. Assuming an opening time of 1/2 cycle for 240.67(B)(4), the equipment damage is (25.98 kA X 0.5 cycles X 100 arcing volts) = 1,299 kW-cycles. Worst-case damage for the minimum arcing current with this proposed List Item for fusible switches (18,186 kW-cycles) is less than 12% of the worst-case damage allowed by 230.95(A) (155,880 kW-cycles). See Figure 1.

As allowed by Proposed List Item 5. The IEEE 1584-2018 minimum arcing current is 25.98kA. Assuming an opening time of 4 cycles for 240.87(B)(1), (B)(2), or (B)(4), the equipment damage is (25.98 kA X 4 cycles X 100 arcing volts) = 10,392 kW-cycles. Assuming an opening time of 3 cycles for 240.87(B)(5) or (B)(6), the equipment damage is (25.98 kA X 3 cycles X 100 arcing volts) = 7,794 kW-cycles. Worst-case damage for the minimum arcing current with this proposed List Item for circuit breakers (10,392 KW-Cycles) is less than 7% of the worst-case damage allowed by 230.95(A) (155,880 kW-cycles). See Figure 1.

Worst Case Equipment Damage with 100 kA Available Fault Current

As allowed by 230.95(A). For an available fault current of 100kA, the IEEE 1584-2018 three phase minimum arcing current is 33.75 kA. Using the maximum 230.95(A) opening time of 60 cycles, the equipment damage is (33.75 kA X 60 cycles X 100 arcing volts) = 202,500 kW-cycles. See Figure 1.

As allowed by Proposed List Item 4. The IEEE 1584-2018 minimum arcing current is 33.75 kA. Assuming the maximum opening time of 4.2 cycles (0.07 seconds) for 240.67(B), the equipment damage is 33.75 kA X 4.2 cycles X 100 arcing volts) = 14,175 kW-cycles. Assuming an opening time of 7 cycles for 240.67(B)(1) and (B)(3), the equipment damage is (33.75 kA X 7 cycles X 100 arcing volts = 23625 kW-cycles. Assuming an opening time of 1/2 cycle for 240.67(B)(4), the equipment damage is (33.75 kA X 0.5 cycles X 100 arcing volts) = 1688 kW-cycles. Worst-case damage for the minimum arcing current with this proposed List Item for fusible switches (23625 kW-cycles) is less than 12% of the worst-case damage allowed by 230.95(A) (202,500 kW-cycles). See Figure 1.

As allowed by Proposed List Item 5. For an available fault current of 100kA, the IEEE 1584-2018 minimum arcing current is 33.75 kA. Assuming an opening time of 4 cycles for 240.87(B)(1), (B)(2), or (B)(4), the equipment damage is (33.75 kA X 4.0 cycles X 100 arcing volts) = 13,500 kW-cycles. Assuming an opening time of 3 cycles for 240.87(B)(5) or (B)(6), the equipment damage is (33.75 kA X 3 cycles X 100 arcing volts) = 10,125 kW-cycles. Worst-case damage for the minimum arcing current with this proposed List Item for circuit breakers (13,500 KW-Cycles) is less than 7% of the worst-case damage allowed by 230.95(A) (202,500 kW-cycles). See Figure 1

Figure 1 (See attached file)
Figures 1 shows that equipment damage allowed by this Public Input is always, from 10,000 amperes available through 100,000 amperes available, just a small fraction of the equipment damage allowed by 230.95(A).

One might ask whether it is possible that the alternate systems proposed by this Public Input could be set such that they might provide arc energy reduction, but not operate during a lower level ground fault where traditional GFPE will provide protection. That question is answered by the very last lines of the proposed new language for both fusible switches and circuit breakers, as both the fusible switches and circuit breakers must be “set to operate at the lower of the calculated minimum arcing current or 38% of the available fault current.” Since we know the minimum three phase arcing current from IEEE 1584-2018 and the minimum sustainable phase to ground arcing current of 38% of the available fault current, we know whether or not the fusible switch or circuit breaker is set to operate at those values. So, there is no minimum value of actual arcing current that could be so small as to be picked up by 230.95(A) requirements that would not also be sensed by the requirements of List Items 4 and 5.

Let’s look at an example with 10,000 available short-circuit amperes (lowest available fault current for which List Items 4 and 5 could apply). In this case the minimum 1584-2018 three-phase arcing current is 6.09 kA and the minimum sustainable phase-to-ground current is 38% of 10,000 amps = 3.8 kA. Per the requirements of the proposed exceptions the fusible switch or circuit breaker must be set to operate at the lower of either 6.09 kA or 3.8 kA, so the fusible switch or circuit breaker must operate for arcing currents of 3.8 kA or greater. If a three phase arcing fault occurs it is calculated to be 6.09 kA with the possibility that a single phase to ground arcing fault could be as low as 3.8 kA. In either case, the requirements of Exceptions 4 and 5 assure that the arcing fault is taken off-line in no more than 7 cycles for List Item 4 and no more than 4 cycles for List Item 5, while 230.95(A) would allow a full 60 cycles.

What happens if the available fault current is less than or even significantly less than 10,000 amperes? Then the proposed List Items 4 and 5 do not apply and GFPE would be required.

Energy reducing maintenance switches (240.67(B)(2) and 240.87(B)(3)) are not included in the exceptions because energy-reducing maintenance switches are typically turned off when a worker is not working on energized equipment, whereas ground fault protection is constantly protecting the equipment, whether or not a worker is working on the energized equipment.

The Approved Equivalent Means (240.67(B)(5) and 240.87(B)(7)) are excluded because the opening times for these methods are unclear.

Conclusion:

This Public Input takes advantage of the arc-energy reduction requirements found in 240.67 and 240.87. It doesn’t require GFPE whenever specific 240.67 and 240.87 methods to reduce clearing time are utilized. Arc energy reduction methods, as detailed in List Items 4 and 5, must open for “all” actual arcing ground faults and in a much faster time than allowed by 230.95(A). Reviewing Figure 1, it becomes obvious that List Items 4 and 5 will limit the arcing fault damage to the equipment to a level that is considerably less than that currently allowed by the requirements found in 230.95(A).

Submitter Information Verification

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Submittal Date: Thu Jul 27 16:35:03 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: Even with the limitations proposed in the new exceptions, the arc energy reduction technologies may not operate above the pickup current levels specified in 230.95(A), but below the minimum arcing current. Ground-fault currents may exist in this range, and the arc energy reduction technology may not operate on this current unless the resulting damage to equipment leads to a higher current arcing fault. Additionally, differential relaying and energy-reducing active arc-flash mitigation system options would not protect any downstream conductors or equipment, and only provide protection within the equipment boundary. This may ultimately reduce the level of protection currently provided by GFPE, or by a combination of GFPE and arc energy reduction technology, as applicable.

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
(4) **For fused disconnects, where the available fault current, at the fused disconnect, is 10,000 amperes or greater, if the fuses have a clearing time of 0.07 seconds or less at the lower of the calculated minimum available arcing current or 38% of the available fault current, or if the disconnect switch complies with Section 240.67(B)(1), 240.67(B)(3),or 240.67(B)(4). and is set to operate at the lower of the calculated minimum arcing current or 38% of the available fault current.**
(5) **For circuit breakers, where the available fault current, at the circuit breaker, is 10,000 amperes or greater, if the circuit breaker complies with Section 240.87(B)(2), 240.87(B)(4),240.87(B)(5), or 240.87(B)(6). and is set to operate at the lower of the calculated minimum arcing current or 38% of the available fault current.**

Substantiation

Executive Summary: We can now accurately predict the minimum three-phase arcing current, along with the minimum sustainable line-to-ground arcing current, for an arcing ground fault. Knowing these currents, we can determine whether or not the arc energy reduction methods in proposed List Items 4 and 5 will operate at, or below, those levels. If they do operate at or below those levels, the equipment damage will be just a small percentage of that allowed by the GFPE requirements of 230.95. This applies to all available fault currents of 10,000 amperes or greater.

Background: A requirement (230.95) for ground fault protection of equipment (GFPE) was added to the 1971 NEC® because 480/277 volt, solidly grounded wye services, protected by 1000 ampere and larger overcurrent protective devices, were burning down due to arcing ground faults. 208/120 volt services and those services protected by smaller overcurrent protective devices were not burning down, so they weren't included in the new GFPE requirement. Over many Code cycles, GFPE requirements were also added for branch circuits (210.13), feeders (215.10), and equipment (240.13). In all cases, the intent was to limit, not eliminate, damage to the switchboard, switchgear, panelboard or equipment being supplied by the 1000 ampere and larger overcurrent protective device.

Present Day: The electrical industry has evolved considerably since those early GFPE requirements were introduced. In those years, J. R. Dunki-Jacobs, Harris I. Stanback, and R. H. Kaufman authored numerous ground-breaking papers on arcing ground faults and the need for ground fault protection. They accomplished a great deal and their determination that the minimum sustainable line-to-ground arcing fault on a 480/277 volt system was 38% of the available bolted fault current is very close to the values predicted today by IEEE1584-2019. In recent editions of the NEC®, Sections were added to require the protection of an employee that is exposed to dangerous levels of incident energy while working on energized equipment. To avoid serious injuries, employees, working on or near energized equipment, can only withstand a small fraction of the incident energy to which equipment may be subjected by the allowances of 230.95(A). This substantiation compares the levels of equipment damage allowed by existing 230.95(A) with the levels allowed by the employee arc-flash protection requirements of 240.67 and 240.87. It shows that the equipment damage allowed by the employee arc-flash protection requirements of 240.67 and 240.87 is just a small fraction of that allowed by 230.95(A). The following examples utilize IEEE 1584-2018 for a 480 volt arcing fault with 32mm equipment spacing, in a 20”x20”x20” box and an HCB (horizontal conductors in a metal enclosure) configuration. Equipment damage is described in terms of kW-cycles which is a product of arcing current (kA) X number of arcing cycles (cycles) X arc voltage (100 volts on a 480 system).

Worst Case Equipment Damage with 10 kA Available Fault Current

As allowed by 230.95(A). The IEEE 1584-2018 minimum arcing current is 6.09kA. Using the maximum 230.95(A) opening time of 60 cycles, the equipment damage is (6.09 kA X 60 cycles X 100 arcing volts) = 36,540 kW-cycles. See Figure 1.

As allowed by Proposed List Item 4. The IEEE 1584-2018 minimum arcing current is 6.09kA. Assuming the maximum opening time of 4.2 cycles (0.07 seconds) for 240.67(B), the equipment damage is 6.09 kA X 4.2 cycles X 100 arcing volts) = 2,558 kW-cycles. Assuming an opening time of 7 cycles for 240.67(B)(1) and (B)(3), the equipment damage is (6.09 kA X 7 cycles X 100 arcing volts = 4,263 kW-cycles. Assuming an opening time of 1/2 cycle for 240.67(B)(4), the equipment damage is (6.09 kA X 0.5 cycles X 100 arcing volts) = 305 kW-cycles. Worst-case damage for the minimum arcing current with this proposed List Item for fusible switches (4,263 kW-cycles) is less than 12% of the worst-case damage allowed by 230.95(A) (36,540 kW-cycles). See Figure 1.

As allowed by Proposed List Item 5. The IEEE 1584-2018 minimum arcing current is 6.09kA. Assuming an opening time of 4 cycles for 240.87(B)(1), (B)(2), or (B)(4), the equipment damage is (6.09 kA X 4.0 cycles X 100 arcing volts) = 2,436 kW-cycles. Assuming an opening time of 3 cycles for 240.87(B)(5) or (B)(6), the equipment damage is (6.09 kA X 3 cycles X 100 arcing volts) = 1,827 kW-cycles. Worst-case damage for the minimum arcing current with this proposed List Item for circuit breakers (2,426 KW-Cycles) is less than 7% of the worst-case damage allowed by 230.95(A) (36,540 kW-cycles). See Figure 1.

Worst Case Equipment Damage with 25 kA Available Fault Current

As allowed by 230.95(A). The IEEE 1584-2018 minimum arcing current is 15.21kA. Using the maximum 230.95(A) opening time of 60 cycles, the equipment damage is (15.21 kA X 60 cycles X 100 arcing volts) = 91,260 kW-cycles. See Figure 1.

As allowed by Proposed List Item 4. The IEEE 1584-2018 minimum arcing current is 15.21kA. Assuming the maximum opening time of 4.2 cycles for 240.67(B), the equipment damage is (15.21 kA X 4.2 cycles X 100 arcing volts) = 6,388 kW-cycles. Assuming an opening time of 7 cycles for 240.67(B)(1) and (B)(3), the equipment damage is (15.21 kA X 7 cycles X 100 arcing volts) = 10,647 kW-cycles. Assuming an opening time of 1/2 cycle for 240.67(B)(4), the equipment damage is (15.21 kA X 0.5 cycles X 100 arcing volts) = 761 kW-cycles. Worst-case damage for the minimum arcing current with this proposed List Item for fusible switches (10,647 kW-cycles) is less than 12% of the worst-case damage allowed by 230.95(A) (91,260 kW-cycles). See Figure 1.

As allowed by Proposed List Item 5. The IEEE 1584-2018 minimum arcing current is 15.21kA. Assuming an opening time of 4 cycles for 240.87(B)(1), (B)(2), or (B)(4), the equipment damage is (15.21 kA X 4 cycles X 100 arcing volts) = 6,084 kW-cycles. Assuming an opening time of 3 cycles for 240.87(B)(5) or (B)(6), the equipment damage is (15,21 kA X 3 cycles X 100 arcing volts) = 4,563 kW-cycles. Worst-case damage for the minimum arcing current with this proposed List Item for circuit breakers (6,084 kW-Cycles) is less than 7% of the worst-case damage allowed by 230.95(A) (91,260 kW-cycles). See Figure 1.

Worst Case Equipment Damage with 50 kA Available Fault Current

As allowed by 230.95(A). The IEEE 1584-2018 minimum arcing current is 25.98kA. Using the maximum 230.95(A) opening time of 60 cycles, the equipment damage is (25.98 kA X 60 cycles X 100 arcing volts) = 155,880 kW- cycles. See Figure 1.

As allowed by Proposed List Item 4. The IEEE 1584-2018 minimum arcing current is 25.98kA. Assuming an opening time of 4.2 cycles for 240.67(B), the equipment damage is (25.98 kA X 4.2 cycles X 100 arcing volts) = 10,912 kW-cycles. Assuming an opening time of 7 cycles for 240.67(B)(1) and (B)(3), the equipment damage is (25.98 kA X 7 cycles X 100 arcing volts) = 18,186 kW-cycles. Assuming an opening time of 1/2 cycle for 240.67(B)(4), the equipment damage is (25.98 kA X 0.5 cycles X 100 arcing volts) = 1,299 kW-cycles. Worst-case damage for the minimum arcing current with this proposed List Item for fusible switches (18,186 kW-cycles) is less than 12% of the worst-case damage allowed by 230.95(A) (155,880 kW-cycles). See Figure 1.

As allowed by Proposed List Item 5. The IEEE 1584-2018 minimum arcing current is 25.98kA. Assuming an opening time of 4 cycles for 240.87(B)(1), (B)(2), or (B)(4), the equipment damage is (25.98 kA X 4 cycles X 100 arcing volts) = 10,392 kW-cycles. Assuming an opening time of 3 cycles for 240.87(B)(5) or (B)(6), the equipment damage is (25.98 kA X 3 cycles X 100 arcing volts) = 7,794 kW-cycles. Worst-case damage for the minimum arcing current with this proposed List Item for circuit breakers (10,392 KW-Cycles) is less than 7% of the worst-case damage allowed by 230.95(A) (155,880 kW-cycles). See Figure 1.

Worst Case Equipment Damage with 100 kA Available Fault Current

As allowed by 230.95(A). For an available fault current of 100kA, the IEEE 1584-2018 three phase minimum arcing current is 33.75 kA. Using the maximum 230.95(A) opening time of 60 cycles, the equipment damage is (33.75 kA X 60 cycles X 100 arcing volts) = 202,500 kW-cycles. See Figure 1.

As allowed by Proposed List Item 4. The IEEE 1584-2018 minimum arcing current is 33.75 kA. Assuming the maximum opening time of 4.2 cycles (0.07 seconds) for 240.67(B), the equipment damage is 33.75 kA X 4.2 cycles X 100 arcing volts) = 14,175 kW-cycles. Assuming an opening time of 7 cycles for 240.67(B)(1) and (B)(3), the equipment damage is (33.75 kA X 7 cycles X 100 arcing volts = 23625 kW-cycles. Assuming an opening time of 1/2 cycle for 240.67(B)(4), the equipment damage is (33.75 kA X 0.5 cycles X 100 arcing volts) = 1688 kW-cycles. Worst-case damage for the minimum arcing current with this proposed List Item for fusible switches (23625 kW-cycles) is less than 12% of the worst-case damage allowed by 230.95(A) (202,500 kW-cycles). See Figure 1.

As allowed by Proposed List Item 5. For an available fault current of 100kA, the IEEE 1584-2018 minimum arcing current is 33.75 kA. Assuming an opening time of 4 cycles for 240.87(B)(1), (B)(2), or (B)(4), the equipment damage is (33.75 kA X 4.0 cycles X 100 arcing volts) = 13,500 kW-cycles. Assuming an opening time of 3 cycles for 240.87(B)(5) or (B)(6), the equipment damage is (33.75 kA X 3 cycles X 100 arcing volts) = 10,125 kW-cycles. Worst-case damage for the minimum arcing current with this proposed List Item for circuit breakers (13,500 KW-Cycles) is less than 7% of the worst-case damage allowed by 230.95(A) (202,500 kW-cycles). See Figure 1

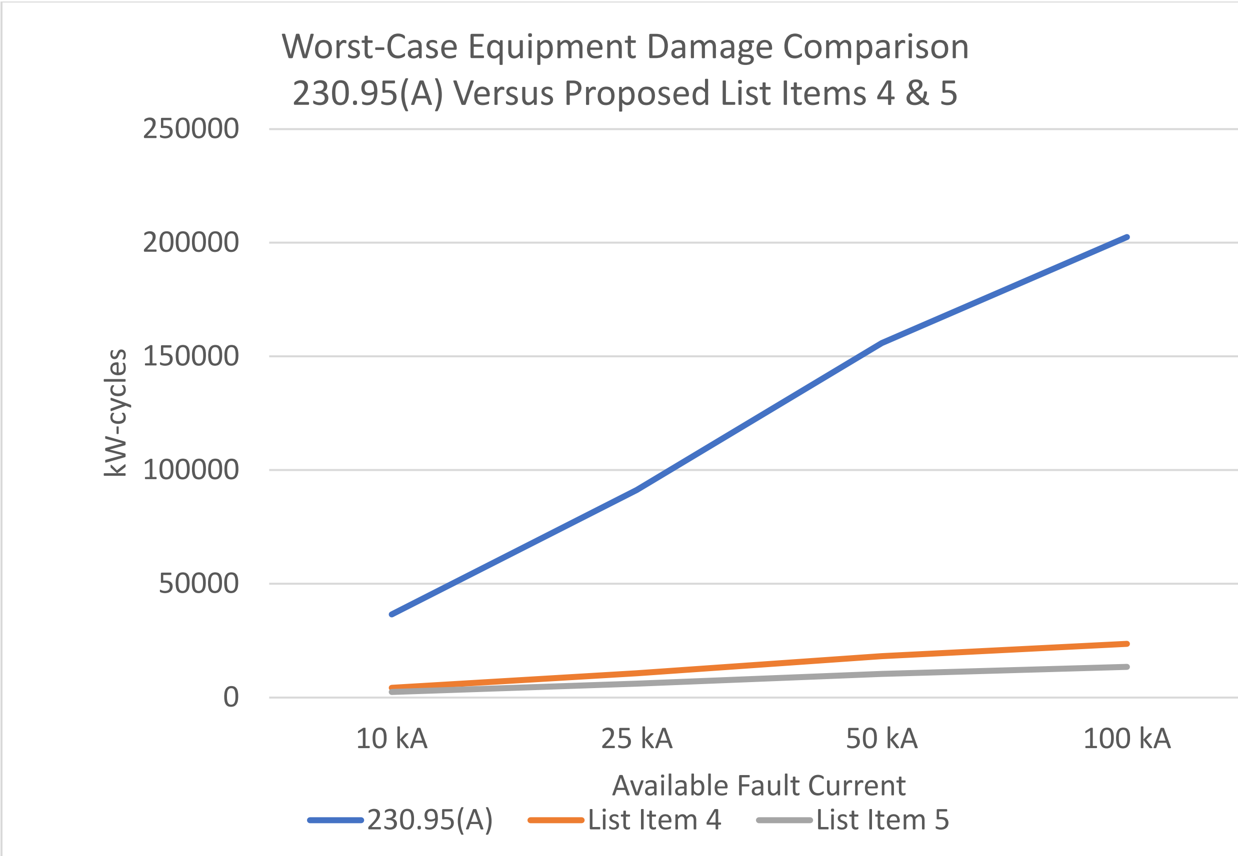

Figure 1

Figures 1 shows that equipment damage allowed by this Public Input is always, from 10,000 amperes available through 100,000 amperes available, just a small fraction of the equipment damage allowed by 230.95(A).

One might ask whether it is possible that the alternate systems proposed by this Public Input could be set such that they might provide arc energy reduction, but not operate during a lower level ground fault where traditional GFPE will provide protection. That question is answered by the very last lines of the proposed new language for both fusible switches and circuit breakers, as both the fusible switches and circuit breakers must be ***"set to operate at the lower of the calculated minimum arcing current or 38% of the available fault current."*** Since we know the minimum three phase arcing current from IEEE 1584-2018 and the minimum sustainable phase to ground arcing current of 38% of the available fault current, we know whether or not the fusible switch or circuit breaker is set to operate at those values. So, there is no minimum value of actual arcing current that could be so small as to be picked up by 230.95(A) requirements that would not also be sensed by the requirements of List Items 4 and 5.

Let's look at an example with 10,000 available short-circuit amperes (lowest available fault current for which List Items 4 and 5 could apply). In this case the minimum 1584-2018 three-phase arcing current is 6.09 kA and the minimum sustainable phase-to-ground current is 38% of 10,000 amps = 3.8 kA. Per the requirements of the proposed exceptions the fusible switch or circuit breaker must be set to operate at the lower of either 6.09 kA or 3.8 kA, so the fusible switch or circuit breaker must operate for arcing currents of 3.8 kA or greater. If a three phase arcing fault occurs it is calculated to be 6.09 kA with the possibility that a single phase to ground arcing fault could be as low as 3.8 kA. In either case, the requirements of Exceptions 4 and 5 assure that the arcing fault is taken off-line in no more than 7 cycles for List Item 4 and no more than 4 cycles for List Item 5, while 230.95(A) would allow a full 60 cycles.

What happens if the available fault current is less than or even significantly less than 10,000 amperes? Then the proposed List Items 4 and 5 do not apply and GFPE would be required.

Energy reducing maintenance switches (240.67(B)(2) and 240.87(B)(3)) are not included in the exceptions because energy-reducing maintenance switches are typically turned off when a worker is not working on energized equipment, whereas ground fault protection is constantly protecting the equipment, whether or not a worker is working on the energized equipment.

The Approved Equivalent Means (240.67(B)(5) and 240.87(B)(7)) are excluded because the opening times for these methods are unclear.

Conclusion: This Public Input takes advantage of the arc-energy reduction requirements found in 240.67 and 240.87. It doesn't require GFPE whenever specific 240.67 and 240.87 methods to reduce clearing time are utilized. Arc energy reduction methods, as detailed in List Items 4 and 5, must open for **"all"** actual arcing ground faults and in a much faster time than allowed by 230.95(A). Reviewing Figure 1, it becomes obvious that List Items 4 and 5 will limit the arcing fault damage to the equipment to a level that is considerably less than that currently allowed by the requirements found in 230.95(A).

Public Input No. 4283-NFPA 70-2023 [Section No. 240.13]

240.13 Ground-Fault Protection of Equipment.

(A) AC Systems.

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

(B) DC Systems.

Ground-fault protection of equipment shall be provided in accordance with 230.95 for solidly grounded dc electrical systems of more than 150 volts to ground but not exceeding 1500 volts dc line-to-line 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

Statement of Problem and Substantiation for Public Input

This Public Input is submitted on behalf of a Correlating Committee DC Task Group consisting of Danish Zia, Jason Fisher, Randy Dollar, Larry Wildermuth, Scott Higgins, Scott Harding, Mark Earley, Jason Hopkins, Christopher Vance, Chad Kennedy and Derrick Atkins. This Public Input, along with other Public Inputs, was developed with the goal of improving usability and accuracy on requirements associated with DC circuits.

DC residential and commercial installations are emerging in the electrical infrastructure and are expected to be a growing alternative to the traditional AC only utility fed building. Examples include the US DOE Grid-interactive Efficient Buildings project (Note 1), the Purdue University RENEWW house (Note 2), and a DC Microgrid community in Vermont (Note 3). These installations may involve buildings that are distributed entirely with DC, or with an AC/DC hybrid distribution.

The requirements of Section 240.13 and 230.95 address ground-faults on equipment which could propagate into a larger arcing fault, potentially causing significant loss of property and life. However, the requirements of Section 240.13 and 230.95 and related sections are currently limited to solidly grounded wye AC circuits only. The hazards addressed by this type of protection also exist in grounded DC circuits, and a resulting arcing fault may be more severe due to a lack of zero cross-over in DC waveforms. As there is continued expansion of DC throughout the infrastructure it is necessary to ensure that the same level of protection is provided. This proposal closes a gap in the Code for DC circuits where similar hazards exist but ground-fault protection of equipment may not be provided.

Note 1 - https://www.energy.gov/sites/default/files/2020/09/f79/bto-geb-project-summary-093020.pdf
Note 2 - https://engineering.purdue.edu/ME/News/2022/purdue-house-runs-entirely-on-dc-power
Note 3 - https://www.efficiencyvermont.com/Media/Default/docs/white-papers/Energy_Resilience.pdf

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 4279-NFPA 70-2023 [Section No. 215.10]	
Public Input No. 4280-NFPA 70-2023 [Section No. 230.95]	
Public Input No. 4279-NFPA 70-2023 [Section No. 215.10]	

Public Input No. 4280-NFPA 70-2023 [Section No. 230.95]

Submitter Information Verification

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Submittal Date:	Thu Sep 07 09:23:54 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution:	FR-9235-NFPA 70-2024
Statement:	The committee is including DC in 240.13 to ensure the hazards for arcing faults are also addressed in DC systems from 150V to ground up to 1500V line-to-line.

Public Input No. 2648-NFPA 70-2023 [Section No. 240.15(A)]

(A) Overcurrent Device Required.

A fuse or an overcurrent trip unit of a circuit breaker shall be connected in series with each ungrounded conductor. A combination of a current transformer and overcurrent relay shall be considered equivalent to an overcurrent trip unit.

Informational Note: See Article 430, Parts III, IV, V, and ~~XI of Article 430 for~~ XI for motor circuits.

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. The text is revised to to comply with the NEC Style Manual Section 4.1.4, regarding the use of Parts.
4.1.4 References to an Entire Article. References shall not be made to an entire article, except for the Article 100 or where referenced to provide the necessary context. References to specific parts within articles shall be permitted. References to all parts of an article shall not be permitted. The article number shall precede the part number.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

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Committee: NEC-P10

Committee Statement

Resolution: FR-9196-NFPA 70-2024
Statement: The text is revised to comply with the NEC Style Manual section 4.1.4.

Public Input No. 3398-NFPA 70-2023 [Section No. 240.15(B)(3)]

(3) 3-Phase and 2-Phase Systems.

For line-to-line loads in 4-wire, 3-phase systems or 5-wire, 2-phase systems, individual ~~single-pole~~ circuit breakers rated 120/240 volts ac with identified handle ties shall be permitted as the protection for ~~each~~ ungrounded ~~conductor~~ conductors , if the systems have a grounded neutral point and the voltage to ground does not exceed 120 volts.

Statement of Problem and Substantiation for Public Input

Two phase 5 wire systems are still in use, especially in the Philadelphia area.
Revise this section to permit a two pole breaker to be handle tied with another two pole breaker to protect a two phase 4 wire circuit fed from a 5 wire two phase system.

Submitter Information Verification

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Submittal Date: Sat Sep 02 12:55:25 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The existing language does not restrict the use of single-pole circuit breakers rated 120/240 Volts ac with identified handle ties to be used as protection in 5-wire, 2-phase systems. Two pole circuit breakers are not provided with handle ties intended to be used in conjunction with another two-pole circuit breaker.

Public Input No. 1822-NFPA 70-2023 [New Section after 240.16]

Conductors connected to overcurrent protective devices

(A) Conductors conencted to overcurrent protective devices shall have an ampacity not less than the larger of 240.20(A)(1) or 240.20(A)(2)

(1) Without adjustment or Correction factors

Where a conductor that is connected to overcurrent protection supplies continuous loads or any combination of continuous are noncontinuous loads, the minimum 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 conductor(s), is listed for operation at 100 percent of its rating, the ampacity of the 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 conductor 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 conductor installed under this exception shall extend into an enclosure containing either the conductor suppply or the conductor load terminations, as covered in 110.14(C)(1)

(2) With adjustment or correction factors

The minimum 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:

See Informative Annex D for Examples D1 through D11

Statement of Problem and Substantiation for Public Input

Sizing conductors to 125% of the continuous load is only required when the conductor is connected to an overcurrent device. The same rules exist in Article 210 and Article 215. Since these rules deal with overcurrent devices, this PI suggests consolidating the rules, deleting them from 210 and 215, and moving them into Article 240. The Author suggests using 240.20 as the new section, as this number is available and is still in Part I. There are companion PIs to delete these sections out of 210 and 215.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 1823-NFPA 70-2023 [Section No. 210.19(A)]	deletion of section in 210
Public Input No. 1824-NFPA 70-2023 [Section No. 215.2(A)]	deletion of section in 215
Public Input No. 1823-NFPA 70-2023 [Section No. 210.19(A)]	
Public Input No. 1824-NFPA 70-2023 [Section No. 215.2(A)]	

Submitter Information Verification

Submitter Full Name: Eric Stromberg
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Submittal Date: Sat Aug 05 14:26:43 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The proposed language addresses conductor sizing and belongs in Article 210 and 215, and not in Article 240.

Public Input No. 2067-NFPA 70-2023 [Section No. 240.21(B)(1)]

(1) Taps Not over 3 m (10 ft) Long.

If the length of the tap conductors does not exceed 3 m (10 ft) and the tap conductors comply with all of the following:

(1) The ampacity of the tap conductors is as follows:

(2) Not less than the combined calculated loads on the circuits supplied by the tap conductors

(3) Not less than the rating of the equipment containing an overcurrent device(s) supplied by the tap conductors or not less than the rating of the overcurrent protective device at the termination of the tap conductors

Exception to b: Where listed equipment, such as a surge-protective device(s) [SPD(s)], is provided with specific instructions on minimum conductor sizing, the ampacity of the tap conductors supplying that equipment shall be permitted to be determined based on the manufacturer's instructions.

(4) The tap conductors do not extend beyond the switchboard, switchgear, enclosed panelboard, disconnecting means, or control devices they supply.

(5) Except at the point of connection to the feeder, the tap conductors are enclosed in a raceway, which extends from the tap to the enclosure of ~~an enclosed~~ a switchboard, switchgear, a panelboard, or control devices, or to the back of an open switchboard.

(6) For field installations, if the tap conductors leave the enclosure or vault in which the tap is made, the ampacity of the tap conductors is not less than one-tenth of the rating of the overcurrent device protecting the feeder conductors.

Informational Note: See 408.36 for overcurrent protection requirements for panelboards.

Statement of Problem and Substantiation for Public Input

The term ‘panelboard’ and ‘enclosed panelboard’ are defined terms. Adding the word ‘enclosed panelboard’ makes the text technically correct. Note: The term ‘Enclosed Panelboard’ was added to NEC Article 100 during the 2023 Code cycle. Deleted ‘an enclosed’ from second level subdivision (3) because it is not needed, the word enclosure is covered previously in the requirement.

Submitter Information Verification

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Submittal Date: Fri Aug 11 14:56:13 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9217-NFPA 70-2024

Statement: The proposed change adds clarity and usability to the Code. Enclosed panelboards was not added because the definition is proposed to be deleted.

Public Input No. 785-NFPA 70-2023 [Section No. 240.21(B)(1)]

(1) Taps Not over 3 m (10 ft) Long.

If the length of the tap conductors does not exceed 3 m (10 ft) and the tap conductors comply with all of the following:

(1) The ampacity of the tap conductors is as follows:

(2) Not less than the combined calculated loads on the circuits supplied by the tap conductors

(3) Not less than the rating of the equipment containing an overcurrent device(s) supplied by the tap conductors or not less than the rating of the overcurrent protective device at the termination of the tap conductors

Exception to b: Where listed equipment, such as a surge-protective device(s) [SPD(s)], is provided with specific instructions on minimum conductor sizing, the ampacity of the tap conductors supplying that equipment shall be permitted to be determined based on the manufacturer's instructions.

(4) The tap conductors do not extend beyond the switchboard, switchgear, panelboard, disconnecting means, or control devices they supply.

(5) Except at the point of connection to the feeder, the tap conductors are enclosed in a raceway, which extends from the tap to the enclosure of an enclosed switchboard, switchgear, ~~a~~ an enclosed panelboard, or control devices, or to the back of an open switchboard.

(6) For field installations, if the tap conductors leave the enclosure or vault in which the tap is made, the ampacity of the tap conductors is not less than one-tenth of the rating of the overcurrent device protecting the feeder conductors.

Informational Note: See 408.36 for overcurrent protection requirements for panelboards.

Statement of Problem and Substantiation for Public Input

This recommendation is only to add the word "enclosed." Terra may have shown more that this was recommended. "Enclosed" is added before "panelboard" to correlate with "enclosed switchboard" used in the same sentence. Also, see the definitions of "panelboard" and "enclosed panelboard" in Article 100. This recommendation correlates with these defined terms.

Submitter Information Verification

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Submittal Date: Tue May 09 16:58:36 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: A panelboard may be installed in other product enclosures. The proposed changes would limit the requirement to only utilize enclosed panelboards.

Public Input No. 1515-NFPA 70-2023 [Section No. 240.21(B)(4)]

(4) Taps in a high bay manufacturing building over 7.5 m (25 ft) Long.

Where the feeder is in a high bay manufacturing building over 11 m (35 ft) high at walls and the installation complies with all the following conditions:

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

(2) The tap conductors are not over 7.5 m (25 ft) long horizontally and not over 30 m (100 ft) total length.

(3) The ampacity of the tap conductors is not less than one-third the rating of the overcurrent device protecting the feeder conductors.

(4) The tap conductors terminate at a single circuit breaker or a single set of fuses that limit the load to the ampacity of the tap conductors. This single overcurrent device shall be permitted to supply any number of additional overcurrent devices on its load side.

(5) The tap conductors are protected from physical damage by being enclosed in an approved raceway or by other approved means.

(6) The tap conductors are continuous from end-to-end and contain no splices.

(7) The tap conductors are sized 6 AWG copper or 4 AWG aluminum or larger.

(8) The tap conductors do not penetrate walls, floors, or ceilings.

(9) The tap is made no less than 9 m (30 ft) from the floor.

Statement of Problem and Substantiation for Public Input

This item is limited to high bay manufacturing buildings. Placing this limitation in the title of (4) adds clarity and consistency . This is similar to item (3) which only pertains to taps supplying a transformer.

Submitter Information Verification

Submitter Full Name: John McCamish
Organization: NECA IBEW Electrical Training
Affiliation: self
Street Address:
City:
State:
Zip:
Submittal Date: Sat Jul 22 19:11:30 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9215-NFPA 70-2024
Statement: The proposed change to the title of item (4) clarifies where it applies.

Public Input No. 3832-NFPA 70-2023 [Section No. 240.21(B)(4)]

(4) Taps in a high bay manufacturing building over 7.5 m (25 ft) Long.

Where the feeder is in a high bay manufacturing building over 11 m (35 ft) high at walls and the installation complies with all the following conditions:

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

(2) The tap conductors are not over 7.5 m (25 ft) long horizontally and not over 30 m (100 ft) total length.

(3) The ampacity of the tap conductors is not less than one-third the rating of the overcurrent device protecting the feeder conductors.

(4) The tap conductors terminate at a single circuit breaker or a single set of fuses that limit the load to the ampacity of the tap conductors. This single overcurrent device shall be permitted to supply any number of additional overcurrent devices on its load side.

(5) The tap conductors are protected from physical damage by being enclosed in an approved raceway or by other approved means.

(6) The tap conductors are continuous from end-to-end and contain no splices.

(7) The tap conductors are sized 6 AWG copper or 4 AWG aluminum or larger.

(8) The tap conductors do not penetrate walls, floors, or ceilings.

(9) The tap is made no less than 9 m (30 ft) from the floor.

Statement of Problem and Substantiation for Public Input

This change adds clarity and aligns with the other similar sections that express more closely what tap conductors are being addressed. Adding the information to the title of this section will help the user of the Code apply this section.

Submitter Information Verification

Submitter Full Name: Thomas Domitrovich
Organization: Eaton Corporation
Street Address:
City:
State:
Zip:
Submittal Date: Tue Sep 05 18:09:24 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9215-NFPA 70-2024
Statement: The proposed change to the title of item (4) clarifies where it applies.

Public Input No. 519-NFPA 70-2023 [Section No. 240.21(C)]

(C) Transformer Secondary Tap Conductors.

A set of conductors feeding a single load, or each set of conductors feeding separate loads, shall be permitted to be connected to a transformer secondary, without overcurrent protection at the secondary, as specified in 240.21(C)(1) through (C)(6). Section 240.4(B) shall not be permitted for transformer secondary conductors.

Informational Note: See 450.3 for overcurrent protection requirements for transformers.

(1) Protection by Primary Overcurrent Device.

Conductors supplied by the secondary side of a single-phase transformer having a 2-wire (single-voltage) secondary, or a three-phase, delta-delta connected transformer having a 3-wire (single-voltage) secondary, shall be permitted to be protected by overcurrent protection provided on the primary (supply) side of the transformer, provided this protection is in accordance with 450.3 and does not exceed the value determined by multiplying the secondary conductor ampacity by the secondary-to-primary transformer voltage ratio.

Single-phase (other than 2-wire) and multiphase (other than delta-delta, 3-wire) transformer secondary conductors are not considered to be protected by the primary overcurrent protective device.

(2) Transformer Secondary Conductors Not over 3 m (10 ft) Long.

If the length of secondary conductor does not exceed 3 m (10 ft) and complies with all of the following:

(1) The ampacity of the secondary conductors is as follows:

 (2) Not less than the combined calculated loads on the circuits supplied by the secondary conductors

 (3) Not less than the rating of the equipment containing an overcurrent device(s) supplied by the secondary conductors or not less than the rating of the overcurrent protective device at the termination of the secondary conductors

 Exception: Where listed equipment, such as a surge protective device(s) [SPD(s)], is provided with specific instructions on minimum conductor sizing, the ampacity of the tap conductors supplying that equipment shall be permitted to be determined based on the manufacturer's instructions.

(4) The secondary conductors do not extend beyond the switchboard, switchgear, panelboard, disconnecting means, or control devices they supply.

(5) The secondary conductors are enclosed in a raceway, which shall extend from the transformer to the enclosure of an enclosed switchboard, switchgear, a panelboard, or control devices or to the back of an open switchboard.

(6) For field installations where the secondary conductors leave the enclosure or vault in which the supply connection is made, the secondary conductors shall have an ampacity that is not less than the value of the primary-to-secondary voltage ratio multiplied by one-tenth of the rating of the overcurrent device protecting the primary of the transformer.

Informational Note: See 408.36 for overcurrent protection requirements for panelboards.

(3) Industrial Installation Secondary Conductors Not over 7.5 m (25 ft) Long.

For the supply of switchgear or switchboards in industrial installations only, where the length of the secondary conductors does not exceed 7.5 m (25 ft) and complies with all of the following:

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

(2) The ampacity of the secondary conductors is not less than the secondary current rating of the transformer, and the sum of the ratings of the overcurrent devices does not exceed the ampacity of the secondary conductors.

(3) All overcurrent devices are grouped.

(4) The secondary conductors are protected from physical damage by being enclosed in an approved raceway or by other approved means.

(4) Outside Secondary Conductors.

Where the conductors are located outside of a building or structure, except at the point of load termination, and comply with all of the following conditions:

(1) The conductors are protected from physical damage in an approved manner.

(2) The conductors terminate at a single circuit breaker or a single set of fuses that limit the load to the ampacity of the conductors. This single overcurrent device shall be permitted to supply any number of additional overcurrent devices on its load side.

(3) The overcurrent device for the conductors is an integral part of a disconnecting means or shall be located immediately adjacent thereto.

(4) The disconnecting means for the conductors is installed at a readily accessible location complying with one of the following:

(5) Outside of a building or structure

(6) Inside, nearest the point of entrance of the conductors

(7) Where installed in accordance with 230.6 , nearest the point of entrance of the conductors

(5) Secondary Conductors from a Feeder Tapped Transformer.

Transformer secondary conductors installed in accordance with 240.21(B)(3) shall be permitted to have overcurrent protection as specified in that section.

(6) Secondary Conductors Not over 7.5 m (25 ft) Long.

Where the length of secondary conductor does not exceed 7.5 m (25 ft) and complies with all of the following:

(1) The secondary conductors shall have an ampacity that is not less than the value of the primary-to-secondary voltage ratio multiplied by one-third of the rating of the overcurrent device protecting the primary of the transformer.

(2) The secondary conductors terminate in a single circuit breaker or set of fuses that limit the load current to not more than the conductor ampacity that is permitted by 310.14.

(3) The secondary conductors are protected from physical damage by being enclosed in an approved raceway or by other approved means.

Statement of Problem and Substantiation for Public Input

Terra may have made it appear that more is being modified than what actually is being proposed. The only recommendation being made by this Public Input is to add the word "Tap" to the title of 240.21(C) if, in fact, these conductors are "tap conductors," by definition. This recommendation is to both make the NEC less vague and to correlate with the last part of the extremely long sentence that is 215.15. Specifically, the phrase "to which the tap conductors are terminated" seem only to apply to 240.21(B) and not to 240.21(C) since only 240.21(B) mentions "tap conductors" while 240.21(C) addresses these conductors as "transformer secondary conductors" which imply that these are not "tap conductors." This is a companion Public Input to one submitted to 215.15 to attempt to correlate the use of the term "tap conductor." The related Public Input should be PI-518.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 518-NFPA 70-2023 [Section No. 215.15]	Related concepts for correlation and clarity.
Public Input No. 518-NFPA 70-2023 [Section No. 215.15]	

Submitter Information Verification

Submitter Full Name: Palmer Hickman
Organization: Electrical Training Alliance
Street Address:
City:
State:
Zip:
Submittal Date: Mon Mar 27 17:57:17 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: In most cases transformer secondary conductors are not tap conductors. A definition for transformer secondary conductors has been proposed to be added.

Public Input No. 2068-NFPA 70-2023 [Section No. 240.21(C)(2)]

(2) Transformer Secondary Conductors Not over 3 m (10 ft) Long.

If the length of secondary conductor does not exceed 3 m (10 ft) and complies with all of the following:

(1) The ampacity of the secondary conductors is as follows:

(2) Not less than the combined calculated loads on the circuits supplied by the secondary conductors

(3) Not less than the rating of the equipment containing an overcurrent device(s) supplied by the secondary conductors or not less than the rating of the overcurrent protective device at the termination of the secondary conductors

Exception: Where listed equipment, such as a surge protective device(s) [SPD(s)], is provided with specific instructions on minimum conductor sizing, the ampacity of the tap conductors supplying that equipment shall be permitted to be determined based on the manufacturer's instructions.

(4) The secondary conductors do not extend beyond the switchboard, switchgear, enclosed panelboard, disconnecting means, or control devices they supply.

(5) The secondary conductors are enclosed in a raceway, which shall extend from the transformer to the enclosure of ~~an enclosed switchboard~~ a switchboard , switchgear, a panelboard, or control devices or to the back of an open switchboard.

(6) For field installations where the secondary conductors leave the enclosure or vault in which the supply connection is made, the secondary conductors shall have an ampacity that is not less than the value of the primary-to-secondary voltage ratio multiplied by one-tenth of the rating of the overcurrent device protecting the primary of the transformer.

Informational Note: See 408.36 for overcurrent protection requirements for panelboards.

Statement of Problem and Substantiation for Public Input

The term 'panelboard' and 'enclosed panelboard' are defined terms. Adding the word 'enclosed panelboard' makes the text technically correct. Note: The term 'Enclosed Panelboard' was added to NEC Article 100 during the 2023 Code cycle. Deleted 'an enclosed' from second level subdivision (3) because it is not needed, the word enclosure is covered previously in the requirement.

Submitter Information Verification

Submitter Full Name: Mike Holt

Organization: Mike Holt Enterprises Inc

Street Address:

City:

State:

Zip:

Submittal Date: Fri Aug 11 14:58:33 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: FR-9218-NFPA 70-2024

Statement: The proposed changes add clarity and usability to the Code. Added "enclosure of a" to item (2) to align with other proposed changes to 240.21(C). Deleted "enclosed" in item (3) because it is redundant.

Public Input No. 786-NFPA 70-2023 [Section No. 240.21(C)(2)]

(2) Transformer Secondary Conductors Not over 3 m (10 ft) Long.

If the length of secondary conductor does not exceed 3 m (10 ft) and complies with all of the following:

(1) The ampacity of the secondary conductors is as follows:

(2) Not less than the combined calculated loads on the circuits supplied by the secondary conductors

(3) Not less than the rating of the equipment containing an overcurrent device(s) supplied by the secondary conductors or not less than the rating of the overcurrent protective device at the termination of the secondary conductors

Exception: Where listed equipment, such as a surge protective device(s) [SPD(s)], is provided with specific instructions on minimum conductor sizing, the ampacity of the tap conductors supplying that equipment shall be permitted to be determined based on the manufacturer's instructions.

(4) The secondary conductors do not extend beyond the switchboard, switchgear, panelboard, disconnecting means, or control devices they supply.

(5) The secondary conductors are enclosed in a raceway, which shall extend from the transformer to the enclosure of an enclosed switchboard, switchgear, ~~a~~ an enclosed panelboard, or control devices or to the back of an open switchboard.

(6) For field installations where the secondary conductors leave the enclosure or vault in which the supply connection is made, the secondary conductors shall have an ampacity that is not less than the value of the primary-to-secondary voltage ratio multiplied by one-tenth of the rating of the overcurrent device protecting the primary of the transformer.

Informational Note: See 408.36 for overcurrent protection requirements for panelboards.

Statement of Problem and Substantiation for Public Input

This recommendation is only to add the word "enclosed." Terra may have shown more that this was recommended. "Enclosed" is added before "panelboard" to correlate with "enclosed switchboard" used in the same sentence. Also, see the definitions of "panelboard" and "enclosed panelboard" in Article 100. This recommendation correlates with these defined terms.

Submitter Information Verification

Submitter Full Name: Palmer Hickman
Organization: Electrical Training Alliance
Street Address:
City:
State:
Zip:
Submittal Date: Tue May 09 17:06:16 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: A panelboard may be installed in other product enclosures. The proposed changes would limit the requirement to only utilize enclosed panelboards.

Public Input No. 532-NFPA 70-2023 [Section No. 240.21(C) [Excluding any Sub-Sections]]

A set of conductors feeding a single load, or each set of conductors feeding separate loads, shall be permitted to be connected to a transformer secondary, without overcurrent protection at the secondary, as specified in 240.21(C)(1) through (C)(6). ~~Section 240.4(B) shall not be permitted for transformer secondary conductors.~~

Informational Note: See 450.3 for overcurrent protection requirements for transformers.

Statement of Problem and Substantiation for Public Input

Create exception as follows:
Exception No. 1: Fuses and circuit breakers with a rating or setting that complies with 240.4(B) or (C) and 240.6 shall be permitted.

This is the exception allowed in 230.90(A), Exception No. 2, for services from a utility. It shouldn't matter who owns a transformer, the utility or the building owner, electricity operates the same for either.

Submitter Information Verification

Submitter Full Name: David Bredhold
Organization: Vitok Engineers
Street Address:
City:
State:
Zip:
Submittal Date: Wed Apr 05 07:20:40 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The proposed change lacks technical substantiation. In addition, it does not comply with 4.3.4 of the Regulations Governing the Development of NFPA Standards.

Public Input No. 1411-NFPA 70-2023 [New Section after 240.22]

TITLE OF NEW CONTENT

240.23 Change in size of Grounded Conductor

Where ungrounded conductors are increased in size from the minimum size allowed that has sufficient ampacity for the intended installation, grounded conductors, where installed, shall be increased in size proportionately, according to the circular mil area of the ungrounded conductors of that circuit.

Statement of Problem and Substantiation for Public Input

Whether conductor sizes are increased for voltage drop or any other reason from their minimum size that has sufficient ampacity, the increased fault current carried by the ungrounded conductors is introduced to the grounding or grounded conductor, depending on the fault. The grounded conductor is expected to carry increased currents in the event of a line to grounded conductor fault, for the duration of the fault, as is the case with proportionately upsized equipment grounding conductors of 250.122B. A line to grounded conductor short circuit can occur as easily as a line conductor to a grounding conductor short circuit (or line to line).

240.23 was deleted from the 2020 NEC. It belongs like 250.122B belongs with the added text provided for 2 reasons:
1. To resemble 250.122B more.
2. 2017’s 240.23 says ‘shall be permitted’. It should be mandatory not permissible.

Note: When this public input was offered for the 2023 code cycle, the CMP wrote, ”This section was deleted as this requirement presently exists in Section 220.61. No technical information was included with the public input.”

220.61 does not address increasing the circular mil area of the grounded conductor proportional to an increased circular mil area of the ungrounded conductors. Regarding technical information, the current value that flows in the grounded conductor during a fault is the same as the current value in the ungrounded conductor, with that short circuit condition.

For these reasons, 240.23 ought to be restored or it may be more fitting to place it in Article 200, 220, or 250.

Submitter Information Verification

Submitter Full Name:	Norman Feck
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Affiliation:	self
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City:	
State:	
Zip:	
Submittal Date:	Fri Jul 14 16:14:12 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: Article 240 is meant for requirements related to overcurrent protection. Requirements for sizing of the grounded conductor is not appropriate under Article 240.

Public Input No. 2692-NFPA 70-2023 [Section No. 240.24(A)]

(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, walking surface 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).

Statement of Problem and Substantiation for Public Input

Many switches or circuit breakers are mounted outdoors, for example on the side of a building, a house, etc. and the surface below the switch or circuit breaker is grass, a flower bed or a sidewalk for example. Current code language could be hard to enforce when the switch or circuit breaker is mounted above something other than a “floor or working platform”. This change is intended to eliminate ambiguity and leaving code language subject to interpretation.

Submitter Information Verification

Submitter Full Name: Gary Hein

Organization: [Not Specified]

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City:

State:

Zip:

Submittal Date: Thu Aug 24 12:49:26 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: FR-9219-NFPA 70-2024

Statement: The text is revised to include “grade” providing clarity and to correlate with 110.26(A)(6).

Public Input No. 3133-NFPA 70-2023 [New Section after 240.24(B)(1)]

(3) Dwelling units.

Statement of Problem and Substantiation for Public Input

Add a new sub section (3) to 240.24(B)(1) to clearly allow dwelling unit service and feeder overcurrent devices to be accessible only to authorized management personnel when they meet the provisions of this subsection 240.21(B)(1).
In many campus, camp, church, rental cottage or "accessory dwelling unit" type occupancies there can be one or more dwelling units under a single management. It does not enhance safety to allow guests access to service and feeder overcurrent devices.
All dwelling units can be considered meeting the NEC definition of a guest suite. Per the NEC code making panel archives there is no evidence of intent to exclude a dwelling from also being a guest suite. Adding dwelling units will clear up code language for building officials.

Submitter Information Verification

Submitter Full Name:	Stephen Schmiechen
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City:	
State:	
Zip:	
Submittal Date:	Tue Aug 29 15:09:04 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: The addition of dormitories is considered unnecessary as multiple-occupancy buildings covers dormitory units. Expanding the list to include dwelling units would restrict access of service and feeder overcurrent protective devices to residents of one and two-family dwelling units, where access to overcurrent protective devices may be necessary and supervision may not be located on site.

Public Input No. 4232-NFPA 70-2023 [Section No. 240.24(B)(1)]

(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

(3) Dormitory units

Statement of Problem and Substantiation for Public Input

Dormitory units are maintained by the building management which provides utilities and maintenance for all occupants. It is hardship when there is a need to access the overcurrent devices located in each individual units. Since dormitory units are under continuous building management supervision, such occupancy shall be permitted to locate the overcurrent devices for branch circuits and feeders in a centralized electric closets at the respective floor.

Submitter Information Verification

Submitter Full Name: Mathher Abbassi

Organization: Abbassi Electric Corp.

Street Address:

City:

State:

Zip:

Submittal Date: Thu Sep 07 02:26:11 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: The addition of dormitories is considered unnecessary as multiple-occupancy buildings covers dormitory units. Expanding the list to include dwelling units would restrict access of service and feeder overcurrent protective devices to residents of one and two-family dwelling units, where access to overcurrent protective devices may be necessary and supervision may not be located on site.

Public Input No. 756-NFPA 70-2023 [Sections 240.24(B)(1), 240.24(B)(2)]

Sections 240.24(B)(1), 240.24(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 (24 hours on-site including public holidays) 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 (24 hours on-site including public holidays) 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.

Statement of Problem and Substantiation for Public Input

The previous wording did not specify what is meant by continuous. That is because the local AHJ may interpret that as having after-hours off-site calls available. That is dangerous because they usually take hours to arrive, and hours is extremely long in the case of electrical fires. Furthermore, such call services might not even be available on public holidays. I added new words to define that as having authorized staff on-site 24 hours a day, 7 days a week including on statutory holidays.

Submitter Information Verification

Submitter Full Name: Conrad Ko
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 01 02:57:06 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: This requirement would be unenforceable within NFPA 70.

Public Input No. 802-NFPA 70-2023 [Section No. 240.24(B)(2)]

(2) Branch-Circuit Overcurrent Protective Devices Supplying Guest Rooms and Guest Suites Without Permanent Cooking Provisions .

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

Statement of Problem and Substantiation for Public Input

OBJECTIVES:
• USABILITY of NEC® and consistent CORRELATION with the defined term's EXTRACTION source NFPA 101® Life Safety Code® regarding INDIVIDUAL guest rooms and individual guest suites of dormitories versus the ENTIRE dormitory occupancy. To address the INDIVIDUAL guest rooms and INDIVIDUAL guest suites of dormitories consistently with usage in NFPA 101® and other Codes, in a companion Public Input No. 799 "Dormitories" is being ADDED to the list of occupancies for "Guest Rooms and Guest Suites", in addition to EXTRACTING NFPA 101® 's informational content for the definition "Dormitory" that addresses the INDIVIDUAL guest rooms and individual guest suites of dormitories. NEC® Correlation Committee [NEC-AAC] take note.
• CORRELATION with NEC 240.24(A) to be "READILY ACCESSIBLE" and with the NEC® Article 100 definition of "ACCESSIBLE, READLY" to be reached quickly by "those to whom READY access is requisite" ["authorized management personnel" already explicitly indicated in 240.24(B)(2)] "without requiring ... actions such as to use tools (OTHER THAN KEYS), to remove obstacles, or to resort to portable ladders". NEC® Correlation Committee [NEC-AAC] take note.

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BACKGROUND: Users of NEC® have encountered interpretational discrepancies with the present confusing wording. Presently, interpretation confusion exists to readers of NEC® regarding the use of the term "dormitory UNIT" versus the present definition's ambiguous clause " ... group SLEEPING ACCOMMODATIONS are provided for more than 16 persons who are not members of the same family IN ONE ROOM, OR A SERIES OF CLOSELY ASSOCIATED ROOMS, ...". Because of misinterpretation, it has been interpreted by some AHJs that the "UNIT" itself MUST accommodate "MORE THAN 16 PERSONS".

.

The phrase "IN ONE ROOM, OR A SERIES OF CLOSELY ASSOCIATED ROOMS" refers to "who are NOT MEMBERS of the SAME FAMILY", and does NOT refer to the "group SLEEPING ACCOMMODATIONS" having to be within in ONE room or ONE suite of rooms. Consequently, "dormitory" refers to the ENTIRE building or the ENTIRE space within that building AS AN OCCUPANCY that must accommodate MORE THAN 16 persons, and NOT to EACH specific sleeping room accommodating more than 16 persons.

.

Misuse of the term "dormitory UNIT" has effectively DIMINISHED SAFETY for what are colloquially called "dormitory rooms" that are now wrongly NOT treated as guest rooms or guest suites WITHIN a DORMITORY OCCUPANY. These so-called dormitory UNITS (INDIVIDUAL ROOMS) are being misinterpreted such that intended GFCI, AFCI, SPD and other protection requirements do NOT APPLY for DORMITORY bedrooms, for DORMITORY living rooms, and for closets and hallways INSIDE the so-called dormitory UNIT if that "UNIT" accommodates FEWER THAN 17 OCCUPANTS.

.

NFPA 101® Informational Annex A has long ago addressed this misinterpretation: "A.3.3.68 Dormitory. Rooms within dormitories intended for the use of individuals for combined living and sleeping purposes are guest rooms or guest suites. Examples of dormitories are college dormitories, fraternity and sorority houses, and military barracks.". Further, "Guest Room" and "Guest Suite" are ALREADY explicitly defined terms in both NFPA 70® and NFPA 101® [3.3.136 for "Guest Room"; 3.3.285.1 for "Guest Suite"].

..

It is essential therefore that the terminology and usage for dormitories and for guest rooms and guest suites of dormitories in NFPA 70® be clarified at this time, CONSISTENT with NFPA 101®, to avoid enforcement confusion between Codes.

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It is also essential that the requirements for READY accessibility to overcurrent protection correlate between 240.24(A), 240,24(B)(2), and the Article 100 definition of "ACCESSIBLE, READLY".

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Related Public Inputs address the corresponding changes elsewhere in NFPA 70 that must be revised accordingly.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 798-NFPA 70-2023 [Definition: Dormitory Unit.]	Clarification of NEC ambiguity in the definition extracted from NFPA 101
Public Input No. 799-NFPA 70-2023 [Section No. 210.17]	Addition of Dormitory occupancies for correlation of INDIVIDUAL guest rooms and INDIVIDUAL guest suites of dormitories
Public Input No. 798-NFPA 70-2023 [Definition: Dormitory Unit.]	
Public Input No. 799-NFPA 70-2023 [Section No. 210.17]	

Submitter Information Verification

Submitter Full Name: Brian Rock
Organization: Hubbell Incorporated
Street Address:
City:
State:
Zip:
Submittal Date: Fri May 12 17:27:11 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: Language in the NEC does not necessarily need to correlate with international codes and other NFPA standards. The current language found under 240.24(B)(2) is technically accurate based on the current definition of ‘dormitory units’ found in Article 100. Also, 240.24(A) already requires circuit breakers and switches containing fuses to be readily accessible. Further clarification regarding accessibility is not necessary.

Public Input No. 1401-NFPA 70-2023 [Section No. 240.24(E)]

(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.

Exception: Existing panelboards, installed in compliance with previous editions of this Code that permitted circuit breakers to be installed in bathrooms shall permit the installation of new feeders, or branch circuits, where there are spare positions or unused circuit breakers.

Statement of Problem and Substantiation for Public Input

Exception would provide provisions for installers to add new feeders or branch circuits in existing panelboards located in bathrooms.

Submitter Information Verification

Submitter Full Name:	Chris Papp
Organization:	[Not Specified]
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Thu Jul 13 13:29:53 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: FR-9226-NFPA 70-2024

Statement: Exception would provide provisions for the installation of new overcurrent protective devices in existing panelboards located in bathrooms. This aligns with 230.71(B).

Public Input No. 3282-NFPA 70-2023 [Section No. 240.24(E)]

(E) Not Located in Bathrooms.

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

Statement of Problem and Substantiation for Public Input

Absent a sink an area with a toilet, a urinal, a tub, a shower, a bidet, or similar plumbing fixtures does not meet the definition of a bathroom. Earlier this year, I had a customer insist that the placement of overcurrent protective devices (main panelboard) in a room (dwelling unit) that contained a bathtub (no shower) was not a bathroom as defined by the NEC and because the room did not contain showing facilities was therefore not a violation of 240.24 (E).

This change is intended to help eliminate ambiguity and a “loophole” regarding what is and is not a bathroom and to not exclude bathtubs. If overcurrent protective devices are prohibited in a room that contains a sink and a toilet for example, overcurrent protective devices should also be prohibited in an area that contains a bathtub.

Submitter Information Verification

Submitter Full Name: Gary Hein
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 31 13:51:08 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: ‘Bathing facility’ is not a defined term in the NEC and adding such terminology to this Section does not add clarity.

Public Input No. 4474-NFPA 70-2023 [New Section after 240.41]

240.42 Arc Energy Reduction

Where fuses or the highest continuous current trip setting for which the actual overcurrent device installed in a circuit breaker rated 1200 amperes or higher, **240.42 (A),** B, and C Shall apply.

(A) Documentation.

Documentation shall be available to those authorized to design, install, operate, or inspect the installation as to the location of the circuit breaker(s). Documentation shall also be provided to demonstrate that the method chosen to reduce clearing time is set to operate at a value below the available arcing current.

(B) Method to Reduce Clearing Time.

(1) Fuses.

A fuse shall have a clearing time of 0.07 seconds or less at the available arcing current, or one of the following shall be provided:

(1) Differential relaying

(2) Energy-reducing maintenance switching with local status indicator

(3) Energy-reducing active arc flash mitigation system

(4) An approved equivalent means

(2) Circuit Breaker.

One of the following means shall be provided and shall be set to operate at less than the available arcing current:

(1) Zone-selective interlocking

(2) Differential relaying

(3) Energy-reducing maintenance switching with local status indicator

(4) Energy-reducing active arc flash mitigation system

(5) An instantaneous trip setting that is less than the available arcing current

(6) An instantaneous override that is less than the available arcing current

(7) An approved equivalent means

Informational Note No. 1: An energy-reducing maintenance switch allows a worker to set a disconnect switch to reduce the clearing time while the worker is working within an arc-flash boundary as defined in *NFPA 70E* -2024, *Standard for Electrical Safety in the Workplace* , and then to set the disconnect switch back to a normal setting after the potentially hazardous work is complete.

Informational Note No. 2: An energy-reducing active arc flash mitigation system helps in reducing arcing duration in the electrical distribution system. No change in the disconnect switch or the settings of other devices is required during maintenance when a worker is working within an arc flash boundary as defined in *NFPA 70E* -2024, *Standard for Electrical Safety in the Workplace* .

Informational Note No. 3: An instantaneous trip is a function that causes a circuit breaker to trip with no intentional delay when currents exceed the instantaneous trip setting or current level. If arcing currents are above the instantaneous trip level, the circuit breaker will trip in the minimum possible time.

Informational Note No. 4: IEEE 1584, *IEEE Guide for Performing Arc Flash Hazard Calculations* , is one of the available methods that provides guidance in determining arcing current.

(C) Performance Testing.

The arc energy reduction protection system shall be performance tested by primary current injection testing or another approved method when first installed on site. This testing shall be conducted by a qualified person(s) in accordance with the manufacturer's instructions.

A written record of this testing shall be made and shall be available to the authority having jurisdiction.

Informational Note:

Some energy reduction protection systems cannot be tested using a test process of primary current injection due to either the protection method being damaged such as with the use of fuse technology or because current is not the primary method of arc detection.

Statement of Problem and Substantiation for Public Input

Creating a new Section with the no changes in the current language. To align the new section 240.42 Arc Energy Reduction.

This Alignment for a new section clarifies the importance of Arc Energy Reduction regardless of fuses or circuit breakers to reduce the clearing time while in the arc-flash boundary.
Combining the two sections together allows those authorized to design, install, operate, or inspect the installation as to the location of the fuses or circuit breakers can easily locate the Article instead of searching for two different Articles in different locations.
See related PI 4460 and 4466

Submitter Information Verification

Submitter Full Name:	Larry Wildermuth
Organization:	Orange County Division of Building Safety
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Thu Sep 07 16:08:46 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: The current locations for 240.67 and 240.87 are appropriate based on the parts that they are located under, as required per section 2.1.5.1 of the NEC Style Manual. Part VI of Article 240 pertains to cartridge fuses and fuseholders, and part VII pertains to circuit breakers. Part IV pertains to disconnecting and guarding and would not be an appropriate location for these requirements. Additionally, the combined text proposed is confusing as it does not clearly state when the requirement applies to a fuse or circuit breaker.

Public Input No. 3691-NFPA 70-2023 [Section No. 240.60(E)]

~~**(E)** Fuse Reducers.~~

~~Fuse reducers shall be listed.~~

Statement of Problem and Substantiation for Public Input

The requirement should be moved to 240.2 for compliance with the NEC Style Manual Section 2.2.1.

Submitter Information Verification

Submitter Full Name: Derrick Atkins
Organization: Minneapolis Electrical JATC
Street Address:
City:
State:
Zip:

Submittal Date: Tue Sep 05 14:07:15 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9228-NFPA 70-2024
Statement: Fuse reducers are moved from 240.60(E) to 240.2(4) for compliance with the NEC Style Manual section 2.2.1.

Public Input No. 4176-NFPA 70-2023 [Section No. 240.67]

240.67 Arc Energy Reduction.

Where fuses rated ~~1200~~ 800 amperes or higher are installed, 240.67(A), (B), and (C) shall apply.

(A) Documentation.

Documentation shall be available to those authorized to design, install, operate, or inspect the installation as to the location of the fuses.

Documentation shall also be provided to demonstrate that the method chosen to reduce clearing time is set to operate at a value below the available arcing current.

(B) Method to Reduce Clearing Time.

A fuse shall have a clearing time of 0.07 seconds or less at the available arcing current, or one of the following means shall be provided and shall be set to operate at less than the available arcing current:

(1) Differential relaying

(2) Energy-reducing maintenance switching with local status indicator

(3) Energy-reducing active arc-flash mitigation system

(4) Current-limiting, electronically actuated fuses

(5) An approved equivalent means

Informational Note No. 1: An energy-reducing maintenance switch allows a worker to set a disconnect switch to reduce the clearing time while the worker is working within an arc-flash boundary as defined in *NFPA 70E*-2021, *Standard for Electrical Safety in the Workplace*, and then to set the disconnect switch back to a normal setting after the potentially hazardous work is complete.

Informational Note No. 2: An energy-reducing active arc-flash mitigation system helps in reducing arcing duration in the electrical distribution system. No change in the disconnect switch or the settings of other devices is required during maintenance when a worker is working within an arc-flash boundary as defined in *NFPA 70E*-2021, *Standard for Electrical Safety in the Workplace*.

Informational Note No. 3: IEEE 1584-2018, *IEEE Guide for Performing Arc Flash Hazard Calculations*, provides guidance in determining arcing current.

(C) Performance Testing.

The arc energy reduction protection system shall be performance tested by primary current injection testing or another approved method when first installed on site. This testing shall be conducted by a qualified person(s) in accordance with the manufacturer's instructions.

A written record of this testing shall be made and shall be available to the authority having jurisdiction.

Informational Note: Some energy reduction protection systems cannot be tested using a test process of primary current injection due to either the protection method being damaged such as with the use of fuse technology or because current is not the primary method of arc detection.

Statement of Problem and Substantiation for Public Input

This public input seeks to reduce the trigger point for applying the requirements of 240.67 from 1200A to 800A. This does not mean that every installation of 800A fuses will require an arc reduction technology because of the fact that in many cases the arcing current will be in the current limiting region of the fuse. There are tools available for free to help evaluate the analysis to determine when 240.67 applies and when it doesn't. A report published in Industrial Safety and Hygiene News estimated that, on average, there are 30,000 arc flash incidents every year. The report went on to estimate that those incidents resulted in an average annual totals of 7,000 burn injuries, 2,000 hospitalizations, and 400 fatalities per year. it is not possible to control where an arc flash occurs and it is not determined by the size of the overcurrent protective device nor the type of equipment. Accidents happen and when they do we need to ensure our electrical workers are provided with the protection that they deserve. This requirement will make the industry think about the installation and go through a process of determining if an arc reduction technology is needed. It will NOT be required in EVERY instance. The fact is that the smaller the overcurrent device the more likely the arcing current will be in the instantaneous region. But when it will not, it will be important that the design include a technology that our electrical workers can leverage to provide protection should justified energized work be conducted and if a mistake is made. Even qualified persons make mistakes.

This public input will help provide arc flash reduction but only when it is needed.

Submitter Information Verification

Submitter Full Name: Thomas Domitrovich
Organization: Eaton Corporation
Street Address:
City:
State:
Zip:
Submittal Date: Wed Sep 06 19:33:19 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The proposed revision to lower the fuse rating to 1000A or 800A for arc-energy reduction requirements is not technically substantiated.

Public Input No. 4179-NFPA 70-2023 [Section No. 240.67]

240.67 Arc Energy Reduction.

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

(A) Documentation.

Documentation shall be available to those authorized to design, install, operate, or inspect the installation as to the location of the fuses.

Documentation shall also be provided to demonstrate that the method chosen to reduce clearing time is set to operate at a value below the available arcing current.

(B) Method to Reduce Clearing Time.

A fuse shall have a clearing time of 0.07 seconds or less at the available arcing current, or one of the following means shall be provided and shall be set to operate at less than the available arcing current:

(1) Differential relaying

(2) Energy-reducing maintenance switching with local status indicator

(3) Energy-reducing active arc-flash mitigation system

(4) Current-limiting, electronically actuated fuses

(5) An approved equivalent means

Informational Note No. 1: An energy-reducing maintenance switch allows a worker to set a disconnect switch to reduce the clearing time while the worker is working within an arc-flash boundary as defined in *NFPA 70E*-2021, *Standard for Electrical Safety in the Workplace*, and then to set the disconnect switch back to a normal setting after the potentially hazardous work is complete.

Informational Note No. 2: An energy-reducing active arc-flash mitigation system helps in reducing arcing duration in the electrical distribution system. No change in the disconnect switch or the settings of other devices is required during maintenance when a worker is working within an arc-flash boundary as defined in *NFPA 70E*-2021, *Standard for Electrical Safety in the Workplace*.

Informational Note No. 3: IEEE 1584-2018, *IEEE Guide for Performing Arc Flash Hazard Calculations*, provides guidance in determining arcing current.

(C) Performance Testing.

The arc energy reduction protection system shall be performance tested by primary current injection testing or another approved method when first installed on site. This testing shall be conducted by a qualified person(s) in accordance with the manufacturer’s instructions.

A written record of this testing shall be made and shall be available to the authority having jurisdiction.

Informational Note: Some energy reduction protection systems cannot be tested using a test process of primary current injection due to either the protection method being damaged such as with the use of fuse technology or because current is not the primary method of arc detection.

Statement of Problem and Substantiation for Public Input

This public input seeks to reduce the trigger point for applying the requirements of 240.67 from 1200A to 800A. This does not mean that every installation of 800A fuses will require an arc reduction technology because of the fact that in many cases the arcing current will be in the current limiting region of the fuse. There are tools available for free to help evaluate the analysis to determine when 240.67 applies and when it doesn't. A report published in Industrial Safety and Hygiene News estimated that, on average, there are 30,000 arc flash incidents every year. The report went on to estimate that those incidents resulted in an average annual totals of 7,000 burn injuries, 2,000 hospitalizations, and 400 fatalities per year. it is not possible to control where an arc flash occurs and it is not determined by the size of the overcurrent protective device nor the type of equipment. Accidents happen and when they do we need to ensure our electrical workers are provided with the protection that they deserve. This requirement will make the industry think about the installation and go through a process of determining if an arc reduction technology is needed. It will NOT be required in EVERY instance. The fact is that the smaller the overcurrent device the more likely the arcing current will be in the instantaneous region. But when it will not, it will be important that the design include a technology that our electrical workers can leverage to provide protection should justified energized work be conducted and if a mistake is made. Even qualified persons make mistakes. This public input will help provide arc flash reduction but only when it is needed.

Submitter Information Verification

Submitter Full Name: Thomas Domitrovich
Organization: Eaton Corporation
Street Address:
City:
State:
Zip:
Submittal Date: Wed Sep 06 19:34:56 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The public input lacks proposed wording in accordance with the NFPA Regulations Governing the Development of Standards section 4.3.4.1.

Public Input No. 4460-NFPA 70-2023 [Section No. 240.67]

~~**240.67** Arc Energy Reduction.~~

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

~~**(A)** Documentation.~~

~~Documentation shall be available to those authorized to design, install, operate, or inspect the installation as to the location of the fuses.~~

~~Documentation shall also be provided to demonstrate that the method chosen to reduce clearing time is set to operate at a value below the available arcing current.~~

~~**(B)** Method to Reduce Clearing Time.~~

~~A fuse shall have a clearing time of 0.07 seconds or less at the available arcing current, or one of the following means shall be provided and shall be set to operate at less than the available arcing current:~~

(1) ~~Differential relaying~~

(2) ~~Energy-reducing maintenance switching with local status indicator~~

(3) ~~Energy-reducing active arc-flash mitigation system~~

(4) ~~Current-limiting, electronically actuated fuses~~

(5) ~~An approved equivalent means~~

> ~~Informational Note No. 1: An energy-reducing maintenance switch allows a worker to set a disconnect switch to reduce the clearing time while the worker is working within an arc-flash boundary as defined in *NFPA 70E* -2021, *Standard for Electrical Safety in the Workplace* , and then to set the disconnect switch back to a normal setting after the potentially hazardous work is complete.~~

> ~~Informational Note No. 2: An energy-reducing active arc-flash mitigation system helps in reducing arcing duration in the electrical distribution system. No change in the disconnect switch or the settings of other devices is required during maintenance when a worker is working within an arc-flash boundary as defined in *NFPA 70E* -2021, *Standard for Electrical Safety in the Workplace* .~~

> ~~Informational Note No. 3: IEEE 1584-2018, *IEEE Guide for Performing Arc Flash Hazard Calculations* , provides guidance in determining arcing current.~~

~~**(C)** Performance Testing.~~

~~The arc energy reduction protection system shall be performance tested by primary current injection testing or another approved method when first installed on site. This testing shall be conducted by a qualified person(s) in accordance with the manufacturer's instructions.~~

~~A written record of this testing shall be made and shall be available to the authority having jurisdiction.~~

> ~~Informational Note: Some energy reduction protection systems cannot be tested using a test process of primary current injection due to either the protection method being damaged such as with the use of fuse technology or because current is not the primary method of arc detection.~~

Statement of Problem and Substantiation for Public Input

Creating a new Section with the no changes in the current language. To align the new section 240.42 Arc Energy Reduction.

This Alignment for a new section clarifies the importance of Arc Energy Reduction regardless of fuses or circuit breakers to reduce the clearing time while in the arc-flash boundary.
Combining the two sections together allows those authorized to design, install, operate, or inspect the installation as to the location of the fuses or circuit breakers can easily locate the Article instead of searching for two different Articles in different locations.
See related PI 4466 and 4474

Submitter Information Verification

Submitter Full Name: Larry Wildermuth

Organization: Orange County Division of Building Safety
Street Address:
City:
State:
Zip:
Submittal Date: Thu Sep 07 15:45:47 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The current locations for 240.67 and 240.87 are appropriate based on the parts that they are located under, as required per section 2.1.5.1 of the NEC Style Manual. Part VI of Article 240 pertains to cartridge fuses and fuseholders, and part VII pertains to circuit breakers. Part IV pertains to disconnecting and guarding and would not be an appropriate location for these requirements. Additionally, the combined text proposed is confusing as it does not clearly state when the requirement applies to a fuse or circuit breaker.

Public Input No. 829-NFPA 70-2023 [Section No. 240.67 [Excluding any Sub-Sections]]

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

Statement of Problem and Substantiation for Public Input

Revising the 1200 amp will match the amperage requirement in 110.16 (B) of 1000 on Services. If the Service has the requirement to have an Arc Flash study done at 1000 amps, the realization of Arc Flash has been an issue at the lower amperage has been proven. That information will require to have the Arc Energy reduction installed at 1000 amperes to provide addition safety for the qualified person.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 830-NFPA 70-2023 [Section No. 240.87 [Excluding any Sub-Sections]]	Same as other, one is fuses the other Circuit breakers.
Public Input No. 830-NFPA 70-2023 [Section No. 240.87 [Excluding any Sub-Sections]]	

Submitter Information Verification

Submitter Full Name: Lowell Reith
Organization: Interstates Construction Servi
Affiliation: Independant Electrical Contractors (IEC)
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 15 14:34:00 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The proposed revision to lower the fuse rating to 1000A or 800A for arc-energy reduction requirements is not technically substantiated.

Public Input No. 4437-NFPA 70-2023 [Section No. 240.80]

240.80 Method of Operation.

Circuit breakers shall be ~~trip free and~~ capable of being closed and opened by manual operation. Their normal method of operation by other than manual means, such as electrical or pneumatic, shall be permitted if means for manual operation are also provided.

Statement of Problem and Substantiation for Public Input

Deleting 'trip free' because this doesn't mean anything in this requirement. This proposed revision will add clarity to Code users.

Submitter Information Verification

Submitter Full Name:	Mike Holt
Organization:	Mike Holt Enterprises Inc
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Thu Sep 07 15:21:26 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution:	FR-9230-NFPA 70-2024
Statement:	For safety reasons, it is important that circuit breakers be trip-free. An informational note is added to 240.80 to clarify functionality of a trip-free circuit breaker.

Public Input No. 3721-NFPA 70-2023 [Section No. 240.83(D)]

(D) Used as Switches.

Circuit breakers used as switches in 120-volt and 277-volt fluorescent lighting circuits shall be ~~listed and shall be~~ marked SWD or HID. Circuit breakers used as switches in high-intensity discharge lighting circuits shall be ~~listed and shall be~~ marked as HID.

Statement of Problem and Substantiation for Public Input

The listing requirement here is redundant as 240.7 requires all branch-circuit over current devices to be listed. If the intention is to require that the breaker is listed to be used as a switch, the marking allowed would usually be dictated by the listing, but for clarity, the phase "listed for the application" may be appropriate here to add clarity.

Submitter Information Verification

Submitter Full Name: Steve Chutka
Organization: Siemens
Street Address:
City:
State:
Zip:
Submittal Date: Tue Sep 05 14:46:38 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: Section 240.83(D) pertains to circuit breakers used as switches. For this application, the circuit breaker may not be the branch-circuit overcurrent protective device specified in 240.7.

Public Input No. 3764-NFPA 70-2023 [Section No. 240.85]

240.85 Applications.

(A) Straight Voltage Rating Circuit Breaker. A circuit breaker with a straight voltage rating, such as 240V or 480V, shall be permitted to be applied in a circuit in which the nominal voltage between any two conductors does not exceed the circuit breaker's voltage rating. A two-pole circuit breaker shall not be used for protecting a 3-phase, corner-grounded delta circuit unless the circuit breaker is marked 1φ–3φ to indicate such suitability.

(B) Slash Voltage Rating Circuit Breaker. A circuit breaker with a slash rating, such as 120/240V or 480Y/277V, shall be permitted to be applied in a solidly grounded circuit where the nominal voltage of any conductor to ground does not exceed the lower of the two values of the circuit breaker's voltage rating and the nominal voltage between any two conductors does not exceed the higher value of the circuit breaker's voltage rating.

Informational Note: Proper application of molded case circuit breakers on 3-phase systems, other than solidly grounded wye, particularly on corner grounded delta systems, considers the circuit breakers' individual pole-interrupting capability.

Statement of Problem and Substantiation for Public Input

Breaking up 240.85 into a list item format to facilitate understanding for Code users. In accordance with NFPA Style Manual section 3.5.1.2 additional subdivisions shall be used where multiple requirements can be broken into independent requirements.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
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City:
State:
Zip:
Submittal Date: Tue Sep 05 15:42:47 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9232-NFPA 70-2024

Statement: Proposed changes were made for compliance with the requirements of sections 2.1.6 and 3.5.1.2 of the NEC Style Manual.

Public Input No. 787-NFPA 70-2023 [Section No. 240.86(B)]

(B) Tested Combinations.

The combination of line-side overcurrent device and load-side circuit breaker(s) is tested and marked on the end use equipment, such as switchboards and panelboards <u>or the enclosure of enclosed panelboards</u> .

Informational Note: See 110.22 for marking of series combination systems.

Statement of Problem and Substantiation for Public Input

This revisions allows the marking to either be placed on the panelboard where not enclosed or on the enclosure of an enclosed panelboard where the panelboard is enclosed. See the definitions of "panelboard" and "enclosed panelboard" in Article 100.

Submitter Information Verification

Submitter Full Name:	Palmer Hickman
Organization:	Electrical Training Alliance
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Tue May 09 17:09:01 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: A marking on the enclosure of an enclosed panelboard would still be considered to be a marking on the panelboard. Additionally, switchboards and panelboards are provided as examples only and not a complete list of all end use equipment.

Public Input No. 3776-NFPA 70-2023 [Section No. 240.87]

240.87 Arc Energy Reduction.

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

(A) Documentation.

Documentation shall be available to those authorized to design, install, operate, or inspect the installation as to the location of the circuit breaker(s). Documentation shall also be provided to demonstrate that the method chosen to reduce clearing time is set to operate at a value below the available arcing current.

(B) Method to Reduce Clearing Time.

One of the following means shall be provided and shall be set to operate at less than the available arcing current:

(1) Zone-selective interlocking

(2) Differential relaying

(3) Energy-reducing maintenance switching ~~with local status indicator~~ with local status indicator. Local to mean within the same enclosure immedialty adjacent to the OCD it controls. Status indicator to have the words on/off, and a "blue" pilot light to indicate the energy reducing feature of the OCP is activated.

(4) Energy-reducing active arc flash mitigation system

(5) An instantaneous trip setting. Temporary adjustment of the instantaneous trip setting to achieve arc energy reduction shall not be permitted.

(6) An instantaneous override

(7) An approved equivalent means

Informational Note No. 1: An energy-reducing maintenance switch allows a worker to set a circuit breaker trip unit to “no intentional delay” to reduce the clearing time while the worker is working within an arc-flash boundary as defined in *NFPA 70E*-2021, *Standard for Electrical Safety in the Workplace*, and then to set the trip unit back to a normal setting after the potentially hazardous work is complete.

Informational Note No. 2: An energy-reducing active arc-flash mitigation system helps in reducing arcing duration in the electrical distribution system. No change in the circuit breaker or the settings of other devices is required during maintenance when a worker is working within an arc-flash boundary as defined in *NFPA 70E*-2021, *Standard for Electrical Safety in the Workplace*.

Informational Note No. 3: An instantaneous trip is a function that causes a circuit breaker to trip with no intentional delay when currents exceed the instantaneous trip setting or current level. If arcing currents are above the instantaneous trip level, the circuit breaker will trip in the minimum possible time.

Informational Note No. 4: See IEEE 1584-2018, *IEEE Guide for Performing Arc Flash Hazard Calculations*, for guidance in determining arcing current.

(C) Performance Testing.

The arc energy reduction protection system shall be performance tested by primary current injection testing or another approved method when first installed on site. This testing shall be conducted by a qualified person(s) in accordance with the manufacturer’s instructions.

A written record of this testing shall be made and shall be available to the authority having jurisdiction.

Informational Note: Some energy reduction protection systems cannot be tested using a test process of primary current injection due to either the protection method being damaged such as with the use of fuse technology or because current is not the primary method of arc detection.

Additional Proposed Changes

File Name	Description	Approved
.1693944686993	240.87(b) code change	

.1693944737489

Statement of Problem and Substantiation for Public Input

240.87(B)3 states "with LOCAL status indicator". Article 100 does not clearly define the words "local" and "Indicator" also, I have seen that some manufacturers have OCD frame sizes that will accept from 800 to 1600 amp trip units. If the frame allows for a 1200 amp OR LARGER trip unit to be installed, then the Frame of the breaker should determine if a Maint switch should be installed.

Submitter Information Verification

Submitter Full Name:	David Fannick
Organization:	David W. Fannick Electrical Sa
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Tue Sep 05 16:00:00 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: The proposed text does not provide any additional clarity and uses terms which are not defined, such as “frame size”. Additionally, requiring the local status indicator to be within the same enclosure immediately adjacent to the circuit breaker may restrict other applications, such as having the local status indicator be available on the outside of the arc-flash perimeter.

Public Input No. 4166-NFPA 70-2023 [Section No. 240.87]

240.87 Arc Energy Reduction.

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 ~~1200~~ 800 amperes or higher, 240.87(A), (B), and (C) shall apply.

(A) Documentation.

Documentation shall be available to those authorized to design, install, operate, or inspect the installation as to the location of the circuit breaker(s). Documentation shall also be provided to demonstrate that the method chosen to reduce clearing time is set to operate at a value below the available arcing current.

(B) Method to Reduce Clearing Time.

One of the following means shall be provided and shall be set to operate at less than the available arcing current:

(1) Zone-selective interlocking

(2) Differential relaying

(3) Energy-reducing maintenance switching with local status indicator

(4) Energy-reducing active arc flash mitigation system

(5) An instantaneous trip setting. Temporary adjustment of the instantaneous trip setting to achieve arc energy reduction shall not be permitted.

(6) An instantaneous override

(7) An approved equivalent means

Informational Note No. 1: An energy-reducing maintenance switch allows a worker to set a circuit breaker trip unit to “no intentional delay” to reduce the clearing time while the worker is working within an arc-flash boundary as defined in *NFPA 70E*-2021, *Standard for Electrical Safety in the Workplace*, and then to set the trip unit back to a normal setting after the potentially hazardous work is complete.

Informational Note No. 2: An energy-reducing active arc-flash mitigation system helps in reducing arcing duration in the electrical distribution system. No change in the circuit breaker or the settings of other devices is required during maintenance when a worker is working within an arc-flash boundary as defined in *NFPA 70E*-2021, *Standard for Electrical Safety in the Workplace*.

Informational Note No. 3: An instantaneous trip is a function that causes a circuit breaker to trip with no intentional delay when currents exceed the instantaneous trip setting or current level. If arcing currents are above the instantaneous trip level, the circuit breaker will trip in the minimum possible time.

Informational Note No. 4: See IEEE 1584-2018, *IEEE Guide for Performing Arc Flash Hazard Calculations*, for guidance in determining arcing current.

(C) Performance Testing.

The arc energy reduction protection system shall be performance tested by primary current injection testing or another approved method when first installed on site. This testing shall be conducted by a qualified person(s) in accordance with the manufacturer’s instructions.

A written record of this testing shall be made and shall be available to the authority having jurisdiction.

Informational Note: Some energy reduction protection systems cannot be tested using a test process of primary current injection due to either the protection method being damaged such as with the use of fuse technology or because current is not the primary method of arc detection.

Statement of Problem and Substantiation for Public Input

This public input seeks to reduce the trigger point for applying the requirements of 240.87 from 1200A to 800A. This does not mean that every installation of 800A circuit breakers will require an arc reduction technology because of the fact that in many cases the arcing current will be in the instantaneous region of the molded case circuit breaker. There are tools available for free to help evaluate the analysis to determine when 240.87 applies and when it doesn't. A report published in Industrial Safety and Hygiene News estimated that, on average, there are

30,000 arc flash incidents every year. The report went on to estimate that those incidents resulted in an average annual totals of 7,000 burn injuries, 2,000 hospitalizations, and 400 fatalities per year. it is not possible to control where an arc flash occurs and it is not determined by the size of the overcurrent protective device nor the type of equipment. Accidents happen and when they do we need to ensure our electrical workers are provided with the protection that they deserve. This requirement will make the industry think about the installation and go through a process of determining if an arc reduction technology is needed. It will NOT be required in EVERY instance. The fact is that the smaller the overcurrent device the more likely the arcing current will be in the instantaneous region. But when it will not, it will be important that the design include a technology that our electrical workers can leverage to provide protection should justified energized work be conducted and if a mistake is made. Even qualified persons make mistakes.

This public input will help provide arc flash reduction but only when it is needed.

Submitter Information Verification

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Submittal Date:	Wed Sep 06 19:14:17 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: The proposed revision to lower the rating to 1000A or 800A for arc-energy reduction requirements is not technically substantiated.

Public Input No. 4466-NFPA 70-2023 [Section No. 240.87]

~~**240.87** Arc Energy Reduction.~~

~~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 1200 amperes or higher, 240.87(A) , (B), and (C) shall apply.~~

~~**(A)** Documentation.~~

~~Documentation shall be available to those authorized to design, install, operate, or inspect the installation as to the location of the circuit breaker(s). Documentation shall also be provided to demonstrate that the method chosen to reduce clearing time is set to operate at a value below the available arcing current.~~

~~**(B)** Method to Reduce Clearing Time.~~

~~One of the following means shall be provided and shall be set to operate at less than the available arcing current:~~

(1) ~~Zone-selective interlocking~~

(2) ~~Differential relaying~~

(3) ~~Energy-reducing maintenance switching with local status indicator~~

(4) ~~Energy-reducing active arc flash mitigation system~~

(5) ~~An instantaneous trip setting. Temporary adjustment of the instantaneous trip setting to achieve arc energy reduction shall not be permitted.~~

(6) ~~An instantaneous override~~

(7) ~~An approved equivalent means~~

> ~~Informational Note No. 1: An energy-reducing maintenance switch allows a worker to set a circuit breaker trip unit to "no intentional delay" to reduce the clearing time while the worker is working within an arc-flash boundary as defined in *NFPA 70E* -2021, *Standard for Electrical Safety in the Workplace* , and then to set the trip unit back to a normal setting after the potentially hazardous work is complete.~~

> ~~Informational Note No. 2: An energy-reducing active arc-flash mitigation system helps in reducing arcing duration in the electrical distribution system. No change in the circuit breaker or the settings of other devices is required during maintenance when a worker is working within an arc-flash boundary as defined in *NFPA 70E* -2021, *Standard for Electrical Safety in the Workplace* .~~

> ~~Informational Note No. 3: An instantaneous trip is a function that causes a circuit breaker to trip with no intentional delay when currents exceed the instantaneous trip setting or current level. If arcing currents are above the instantaneous trip level, the circuit breaker will trip in the minimum possible time.~~

> ~~Informational Note No. 4: See IEEE 1584-2018, *IEEE Guide for Performing Arc Flash Hazard Calculations* , for guidance in determining arcing current.~~

~~**(C)** Performance Testing.~~

~~The arc energy reduction protection system shall be performance tested by primary current injection testing or another approved method when first installed on site. This testing shall be conducted by a qualified person(s) in accordance with the manufacturer's instructions.~~

~~A written record of this testing shall be made and shall be available to the authority having jurisdiction.~~

> ~~Informational Note: Some energy reduction protection systems cannot be tested using a test process of primary current injection due to either the protection method being damaged such as with the use of fuse technology or because current is not the primary method of arc detection.~~

Statement of Problem and Substantiation for Public Input

Creating a new Section with no changes in the current language. To align the new section 240.42 Arc Energy Reduction.

This Alignment for a new section clarifies the importance of Arc Energy Reduction regardless of fuses or circuit

breakers to reduce the clearing time while in the arc-flash boundary.
Combining the two sections together allows those authorized to design, install, operate, or inspect the installation as to the location of the fuses or circuit breakers can easily locate the Article instead of searching for two different Articles in different locations.
See related PI 4460 and 4474

Submitter Information Verification

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Submittal Date:	Thu Sep 07 15:59:33 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: The current locations for 240.67 and 240.87 are appropriate based on the parts that they are located under, as required per 2.1.5.1 of the NEC Style Manual. Part VI of Article 240 pertains to cartridge fuses and fuseholders, and part VII pertains to circuit breakers. Part IV pertains to disconnecting and guarding and would not be an appropriate location for these requirements. Additionally, the combined text proposed is confusing as it does not clearly state when the requirement applies to a fuse or circuit breaker.

Public Input No. 830-NFPA 70-2023 [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 ~~1200 amperes~~ 1000 amperes or higher, 240.87(A), (B), and (C) shall apply.

Statement of Problem and Substantiation for Public Input

Revising the 1200 amp will match the amperage requirement in 110.16 (B) of 1000 on Services. If the Service has the requirement to have an Arc Flash study done at 1000 amps, the realization of Arc Flash has been an issue at the lower amperage has been proven. That information will require to have the Arc Energy reduction installed at 1000 amperes to provide addition safety for the qualified person.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 829-NFPA 70-2023 [Section No. 240.67 [Excluding any Sub-Sections]]	Same reequipments one uses fuses the other circuit breakers.
Public Input No. 829-NFPA 70-2023 [Section No. 240.67 [Excluding any Sub-Sections]]	

Submitter Information Verification

Submitter Full Name: Lowell Reith
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Submittal Date: Mon May 15 14:49:23 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The proposed revision to lower the rating to 1000A or 800A for arc-energy reduction requirements is not technically substantiated.

Public Input No. 1465-NFPA 70-2023 [Article 242]

~~**Article 242**~~ ~~Overvoltage~~ Article 242 Surge Protection

Part I. General

242.1 Scope.

This article provides the general requirements, installation requirements, and connection requirements for ~~overvoltage~~ surge protection and ~~overvoltage protective~~ surge protective devices (SPDs) . Part II covers surge-protective ~~devices (SPDs) permanently~~ devices 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.

242.2 Reconditioned Equipment.

SPDs and surge arresters shall not be reconditioned.

242.3 Other Articles.

Equipment shall be protected against ~~overvoltage in~~ surges in accordance with the article in this *Code* that covers the type of equipment or location specified in Table 242.3.

Table 242.3 Other Articles

Equipment	Article
Class I locations	501
Class II locations	502
Community antenna television and radio distribution systems	820
Critical operations power systems	708
Elevators, dumbwaiters, escalators, moving walks, platform lifts, and stairway chairlifts	620
Emergency systems	700
Equipment over 1000 volts, nominal	495
Fire pumps	695
Industrial machinery	670
Information technology equipment	645
Modular data centers	646
Outdoor overhead conductors over 1000 volts	395
Radio and television equipment	810
Receptacles, cord connectors, and attachment plugs (caps)	406
Wind electric systems	694

Part II. Surge-Protective Devices (SPDs), 1000 Volts or Less

242.6 Listing.

An SPD shall be a listed device.

242.8 Short-Circuit Current Rating.

The SPD shall be marked with a short-circuit current rating and shall not be installed at a point on the system where the available fault current is in excess of that rating. This marking requirement shall not apply to receptacles.

242.9 Indicating.

An SPD shall provide indication that it is functioning properly.

242.12 Uses Not Permitted.

An SPD device shall not be installed in the following:

(1) Circuits over 1000 volts

(2) On ungrounded systems, impedance grounded systems, or corner grounded delta systems unless listed specifically for use on these systems

(3) Where the rating of the SPD is less than the maximum continuous phase-to-ground voltage at the power frequency available at the point of application

242.13 Type 1 SPDs.

Type 1 SPDs shall be installed in accordance with 242.13(A) and (B).

(A) Installation.

Type 1 SPDs shall be permitted to be connected in accordance with one of the following:

(1) To the supply side of the service disconnect as permitted in 230.82 (4)

(2) As specified in 242.14

(B) At the Service.

When installed at services, Type 1 SPDs shall be connected to one of the following:

(1) Grounded service conductor

(2) Grounding electrode conductor

(3) Grounding electrode for the service

(4) Equipment grounding terminal in the service equipment

242.14 Type 2 SPDs.

Type 2 SPDs shall be installed in accordance with 242.14(A) through (C).

(A) Service-Supplied Building or Structure.

Type 2 SPDs shall be connected anywhere on the load side of a service disconnect overcurrent device required in 230.91 unless installed in accordance with 230.82 (8).

(B) Feeder-Supplied Building or Structure.

Type 2 SPDs shall be connected at the building or structure anywhere on the load side of the first overcurrent device at the building or structure.

(C) Separately Derived System.

The SPD shall be connected on the load side of the first overcurrent device in a separately derived system.

242.16 Type 3 SPDs.

Type 3 SPDs shall be permitted to be installed on the load side of branch-circuit overcurrent protection up to the equipment served. If included in the manufacturer's instructions, the Type 3 SPD connection shall be a minimum 10 m (30 ft) of conductor distance from the service or separately derived system disconnect.

242.18 Type 4 and Other Component Type SPDs.

Type 4 component assemblies and other component type SPDs shall only be installed by the equipment manufacturer.

242.20 Number Required.

Where used at a point on a circuit, the SPD shall be connected to each ungrounded conductor.

242.22 Location.

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

242.24 Routing of Conductors.

The conductors used to connect the SPD to the line or bus and to ground shall not be any longer than necessary and shall avoid unnecessary bends.

242.28 Conductor Size.

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

242.30 Connection Between Conductors.

An SPD shall be permitted to be connected between any two conductors — ungrounded conductor(s), grounded conductor, equipment grounding conductor, or grounding electrode conductor. The grounded conductor and the equipment grounding conductor shall be interconnected only by the normal operation of the SPD during a surge.

242.32 Grounding Electrode Conductor Connections and Enclosures.

Except as indicated in this article, SPD grounding connections shall be made as specified in Article 250, Part III. Grounding electrode conductors installed in metal enclosures shall comply with 250.64(E) .

Part III. Surge Arresters, Over 1000 Volts

242.40 Uses Not Permitted.

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

242.42 Surge Arrester Rating.

The duty cycle rating of a surge arrester shall be not less than 125 percent of the maximum 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.

242.44 Number Required.

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

242.46 Location.

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

242.48 Routing of Surge Arrester Equipment Grounding Conductors.

The conductor used to connect the surge arrester to line, bus, or equipment and to an equipment grounding conductor or grounding electrode connection point as provided in 242.50 shall not be any longer than necessary and shall avoid unnecessary bends.

242.50 Connection.

The arrester shall be connected to one of the following:

(1) Grounded service conductor

(2) Grounding electrode conductor

(3) Grounding electrode for the service

(4) Equipment grounding terminal in the service equipment

242.52 Surge-Arrester Conductors.

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

242.54 Interconnections.

The surge arrester protecting a transformer that supplies a secondary distribution system shall be interconnected as specified in 242.54(A) , (B), or (C).

(A) Metal Interconnections.

A metal interconnection shall be made to the secondary grounded circuit conductor or the secondary circuit grounding electrode conductor, if, in addition to the direct grounding connection at the surge arrester, the connection complies with 242.54(A)(1) or (A)(2).

(1) Additional Grounding Connection.

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

(2) Multigrounded Neutral System Connection.

The grounded conductor of the secondary system is part of a multigrounded neutral system or static wire of which the primary neutral conductor or static wire has at least four grounding connections in each 1.6 km (1 mile) of line in addition to a grounding connection at each service.

(B) Through Spark Gap or Device.

Where the surge arrester grounding electrode conductor is not connected as in 242.54(A) , or where the secondary is not grounded as in 242.54(A) but is otherwise grounded as in 250.52 , an interconnection shall be made through a spark gap or listed device as required by 242.54(B)(1) or (B)(2).

(1) Ungrounded or Unigrounded Primary System.

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

(2) Multigrounded Neutral Primary System.

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

(C) By Special Permission.

An interconnection of the surge-arrester ground and the secondary neutral conductor, other than as provided in 242.54(A) or (B), shall be permitted to be made only by special permission.

242.56 Grounding Electrode Conductor Connections and Enclosures.

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

Statement of Problem and Substantiation for Public Input

This Public Input is provided with the understanding that the Scope falls under the jurisdiction of the Correlating Committee. The title of Article 242 should be changed from Overvoltage Protection to Surge Protection. Surge Protective Devices, per UL 1449, protect against voltage surges, not against a "long" overvoltage, such as a "line cross" with a higher voltage circuit. It is misleading to describe the protection in Article 242 as overvoltage protection. It could incorrectly be compared to the overcurrent protection requirements of Article 240, which are of a "long" duration. Other suggested minor changes to the first paragraph of the scope and 242.3 follow this same logic.

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Submittal Date: Tue Jul 18 17:46:06 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The proposed replacement of the term “overvoltage” with “surge” is too narrow. Doing so would potentially prevent other types of overvoltage devices from being allowed to be installed.

Public Input No. 3425-NFPA 70-2023 [Article 242]

Article 242 ~~Overvoltage~~ Surge Protection

Part I. General

242.1 Scope.

This article provides the general requirements, installation requirements, and connection requirements for ~~overvoltage protection and overvoltage~~ surge protective devices (SPDs) and surge arresters . 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.

242.2 Reconditioned Equipment.

SPDs and surge arresters shall not be reconditioned.

242.3 Other Articles.

Equipment shall be protected against ~~overvoltage in~~ surge voltage in accordance with the ~~article~~ articles in this *Code* that ~~covers the~~ cover the type of equipment or location specified in Table 242.3.

Table 242.3 Other Articles

Equipment	Article
Class I locations	501
Class II locations	502
Community antenna television and radio distribution systems	820
Critical operations power systems	708
Elevators, dumbwaiters, escalators, moving walks, platform lifts, and stairway chairlifts	620
Emergency systems	700
Equipment over 1000 volts, nominal	495
Fire pumps	695
Industrial machinery	670
Information technology equipment	645
Modular data centers	646
Outdoor overhead conductors over 1000 volts	395
Radio and television equipment	810
Receptacles, cord connectors, and attachment plugs (caps)	406
Wind electric systems	694

Part II. Surge-Protective Devices (SPDs), 1000 Volts or Less

242.6 Listing.

An SPD shall be a listed device.

242.8 Short-Circuit Current Rating.

The SPD shall be marked with a short-circuit current rating and shall not be installed at a point on the system where the available fault current is in excess of that rating. This marking requirement shall not apply to receptacles.

242.9 Indicating.

An SPD shall provide indication that it is functioning properly.

242.12 Uses Not Permitted.

An SPD device shall not be installed in the following:

(1) Circuits over 1000 volts

(2) On ungrounded systems, impedance grounded systems, or corner grounded delta systems unless listed specifically for use on these systems

(3) Where the rating of the SPD is less than the maximum continuous phase-to-ground voltage at the power frequency available at the point of application

242.13 Type 1 SPDs.

Type 1 SPDs shall be installed in accordance with 242.13(A) and (B).

(A) Installation.

Type 1 SPDs shall be permitted to be connected in accordance with one of the following:

(1) To the supply side of the service disconnect as permitted in 230.82 (4)

(2) As specified in 242.14

(B) At the Service.

When installed at services, Type 1 SPDs shall be connected to one of the following:

(1) Grounded service conductor

(2) Grounding electrode conductor

(3) Grounding electrode for the service

(4) Equipment grounding terminal in the service equipment

242.14 Type 2 SPDs.

Type 2 SPDs shall be installed in accordance with 242.14(A) through (C).

(A) Service-Supplied Building or Structure.

Type 2 SPDs shall be connected anywhere on the load side of a service disconnect overcurrent device required in 230.91 unless installed in accordance with 230.82 (8).

(B) Feeder-Supplied Building or Structure.

Type 2 SPDs shall be connected at the building or structure anywhere on the load side of the first overcurrent device at the building or structure.

(C) Separately Derived System.

The SPD shall be connected on the load side of the first overcurrent device in a separately derived system.

242.16 Type 3 SPDs.

Type 3 SPDs shall be permitted to be installed on the load side of branch-circuit overcurrent protection up to the equipment served. If included in the manufacturer's instructions, the Type 3 SPD connection shall be a minimum 10 m (30 ft) of conductor distance from the service or separately derived system disconnect.

242.18 Type 4 and Other Component Type SPDs.

Type 4 component assemblies and other component type SPDs shall only be installed by the equipment manufacturer.

242.20 Number Required.

Where used at a point on a circuit, the SPD shall be connected to each ungrounded conductor.

242.22 Location.

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

242.24 Routing of Conductors.

The conductors used to connect the SPD to the line or bus and to ground shall not be any longer than necessary and shall avoid unnecessary bends.

242.28 Conductor Size.

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

242.30 Connection Between Conductors.

An SPD shall be permitted to be connected between any two conductors — ungrounded conductor(s), grounded conductor, equipment grounding conductor, or grounding electrode conductor. The grounded conductor and the equipment grounding conductor shall be interconnected only by the normal operation of the SPD during a surge.

242.32 Grounding Electrode Conductor Connections and Enclosures.

Except as indicated in this article, SPD grounding connections shall be made as specified in Article 250, Part III. Grounding electrode conductors installed in metal enclosures shall comply with 250.64(E) .

Part III. Surge Arresters, Over 1000 Volts

242.40 Uses Not Permitted.

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

242.42 Surge Arrester Rating.

The duty cycle rating of a surge arrester shall be not less than 125 percent of the maximum 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.

242.44 Number Required.

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

242.46 Location.

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

242.48 Routing of Surge Arrester Equipment Grounding Conductors.

The conductor used to connect the surge arrester to line, bus, or equipment and to an equipment grounding conductor or grounding electrode connection point as provided in 242.50 shall not be any longer than necessary and shall avoid unnecessary bends.

242.50 Connection.

The arrester shall be connected to one of the following:

(1) Grounded service conductor

(2) Grounding electrode conductor

(3) Grounding electrode for the service

(4) Equipment grounding terminal in the service equipment

242.52 Surge-Arrester Conductors.

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

242.54 Interconnections.

The surge arrester protecting a transformer that supplies a secondary distribution system shall be interconnected as specified in 242.54(A), (B), or (C).

(A) Metal Interconnections.

A metal interconnection shall be made to the secondary grounded circuit conductor or the secondary circuit grounding electrode conductor, if, in addition to the direct grounding connection at the surge arrester, the connection complies with 242.54(A)(1) or (A)(2).

(1) Additional Grounding Connection.

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

(2) Multigrounded Neutral System Connection.

The grounded conductor of the secondary system is part of a multigrounded neutral system or static wire of which the primary neutral conductor or static wire has at least four grounding connections in each 1.6 km (1 mile) of line in addition to a grounding connection at each service.

(B) Through Spark Gap or Device.

Where the surge arrester grounding electrode conductor is not connected as in 242.54(A), or where the secondary is not grounded as in 242.54(A) but is otherwise grounded as in 250.52, an interconnection shall be made through a spark gap or listed device as required by 242.54(B)(1) or (B)(2).

(1) Ungrounded or Unigrounded Primary System.

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

(2) Multigrounded Neutral Primary System.

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

(C) By Special Permission.

An interconnection of the surge-arrester ground and the secondary neutral conductor, other than as provided in 242.54(A) or (B), shall be permitted to be made only by special permission.

242.56 Grounding Electrode Conductor Connections and Enclosures.

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

Statement of Problem and Substantiation for Public Input

In Article 242: This public input replaces the term “overvoltage” with “surge” to keep this rule consistent with the title of all other sections of the code covering surge protection. This includes but is not limited to sections 215.18, 225.42, 230.67, 409.70, 501.35, 502.35, 620.51(E), 645.18, 695.15, 700.8, and 708.20(D).

In Article 242.1: This public input replaces the term “overvoltage” with “surge protective devices (SPDs) and surge arresters” to keep this rule consistent with the title of all other sections of the code covering surge protection. This includes but is not limited to sections 215.18, 225.42, 230.67, 409.70, 501.35, 502.35, 620.51(E), 645.18, 695.15, 700.8, and 708.20(D). Additionally, “and overvoltage protective devices” is deleted as no other section of the code uses this term to describe devices that provide surge protection.

In Article 242.3: This public input replaces the term “overvoltage” with “surge voltage” to keep this rule consistent with the terminology used in all other sections of the code where surge protection is addressed. This includes but is not limited to sections 215.18, 225.42, 230.67, 409.70, 501.35, 502.35, 620.51(E), 645.18, 695.15, 700.8, and 708.20(D).

Note: At this time we recognize that surge protection is the only overvoltage protection, other than surge arrestors, in the code. As additional overvoltage products are added to the code we encourage additional sections be added.

Submitter Information Verification

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Submittal Date:	Sat Sep 02 19:20:48 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: The proposed replacement of the term “overvoltage” with “surge” could prevent the installation of other types of overvoltage devices.

Public Input No. 1319-NFPA 70-2023 [Section No. 242.2]

242.2 Reconditioned Equipment.

Reconditioned SPDs and surge arresters shall not be ~~reconditioned~~ permitted .

Statement of Problem and Substantiation for Public Input

This public input is a part of a series of public inputs that seeks to align the language found across the NEC pertaining to how reconditioned equipment is addressed in the NEC.

The following sections us the language that says “Reconditioned ______ shall not be permitted.” 404.16, 406.2, 408.2,410.2, 470.2, 495.2, 495.49,695.2,700.2,701.2,702.2,708.2,

This change suggests the appropriate way to address reconditioned equipment in the NEC. The NEC is an installation code governing the installation of solutions and in many locations throughout the NEC the solution is either permitted or not permitted. This suggested language would bring all references towards reconditioned equipment in alignment.

Submitter Information Verification

Submitter Full Name: Thomas Domitrovich
Organization: Eaton Corporation
Street Address:
City:
State:
Zip:
Submittal Date: Sat Jul 08 11:30:13 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9236-NFPA 70-2024
Statement: The text and numbering has been revised to comply with the Style Manual, Section 2.2.1.

Public Input No. 2600-NFPA 70-2023 [Section No. 242.2]

242.~~2~~ 3 Reconditioned Equipment.

Reconditioned SPDs and surge arresters shall not ~~be reconditioned~~ be installed .

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. The text is revised to comply with the NEC Style Manual Section 2.2.1 regarding reconditioned equipment.
2.2.1 Parallel Numbering Required. Technical committees shall use the following section numbers for the same purposes within articles. This requirement shall not apply to Articles 90, 100, and 110. If the article does not contain listing or reconditioning requirements, the subdivisions shall not be included in the article.
Required Parallel Numbering Format
XXX.1 Scope.
XXX.2 Listing Requirements.
XXX.3 Reconditioned Equipment.
XXX.3(A) Permitted to be Installed.
XXX.3(B) Not Permitted to be Installed.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 23 19:33:32 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9236-NFPA 70-2024
Statement: The text and numbering has been revised to comply with the Style Manual, Section 2.2.1.

Public Input No. 984-NFPA 70-2023 [Section No. 242.3]

~~**242.3** Other Articles.~~

~~Equipment shall be protected against overvoltage in accordance with the article in this *Code* that covers the type of equipment or location specified in Table 242.3 .~~

~~Table 242.3 Other Articles~~

~~Equipment Article Class I locations 501 Class II locations 502 Community antenna television and radio distribution systems 820 Critical operations power systems 708 Elevators, dumbwaiters, escalators, moving walks, platform lifts, and stairway chairlifts 620 Emergency systems 700 Equipment over 1000 volts, nominal 495 Fire pumps 695 Industrial machinery 670 Information technology equipment 645 Modular data centers 646 Outdoor overhead conductors over 1000 volts 395 Radio and television equipment 810 Receptacles, cord connectors, and attachment plugs (caps) 406 Wind electric systems 694~~

Statement of Problem and Substantiation for Public Input

Section 4.1.4 of the NEC(r) Style Manual prohibits references to an entire article, with the exception of Article 100 or where necessary to provide context. There is a table of contents and an index in this document which can easily lead the user to the other articles found in the code and this table is not necessary as it does not provide a specific section or part of an article that we'd refer the user to. References to 15 different articles in their entirety does not provide any usability improvement and thus I'd recommend deleting this table. Alternatively, if the panel wants to provide specific parts or sections instead, that would also be acceptable but many of these tables were deleted in the last cycle and that should certainly be considered here.

Submitter Information Verification

Submitter Full Name: Richard Holub

Organization: The DuPont Company, Inc.

Street Address:

City:

State:

Zip:

Submittal Date: Thu Jun 08 11:08:12 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: FR-9237-NFPA 70-2024

Statement: The existing Section 242.3 is removed as the NEC is intended for use by qualified people. The information in 242.3 can be found by using the table of contents or the index. The section is also removed for compliance with the NEC Style Manual section 2.2.1.

CC Note – References to other Articles as noted in the existing 242.3 should be reviewed by the Correlating Committee for consistency across the Code.

Public Input No. 2344-NFPA 70-2023 [Section No. 242.13]

242.13 Type 1 SPDs.

Type 1 SPDs shall be installed in accordance with 242.13(A) and (B).

(A) Installation.

Type 1 SPDs shall be permitted to be connected in accordance with one of the following:

(1) To the supply side of the service disconnect as permitted in 230.82(4)

(2) As specified in 242.14

(B) At the Service Equipment .

~~When installed at services,~~ Type 1 SPDs shall be connected to one of the following:

(1) Grounded service conductor

(2) Grounding electrode conductor

(3) Grounding electrode for the service

(4) Equipment grounding terminal in the service equipment

Statement of Problem and Substantiation for Public Input

This public input clarifies the Type 1 SPD is installed at or adjacent to the service equipment.

Submitter Information Verification

Submitter Full Name: Frank Tse
Organization: Hubbell Incorporated
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 16 13:43:32 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: In accordance with 230.82(4), a Type 1 SPD may be installed ahead of the service disconnect and may or may not be installed inside service equipment.

Public Input No. 508-NFPA 70-2023 [Section No. 242.13]

242.13 Type 1 SPDs.

Type 1 SPDs shall be installed in accordance with 242.13(A) and (B).

(A) Installation.

Type 1 SPDs shall be permitted to be connected in accordance with one of the following:

(1) To the supply side of the service disconnect as permitted in 230.82(4)

(2) <u>To the line side of the secondary side overcurrent protective device on a separately derived system</u>

(3) As specified in 242.14

(B) At the Service.

When installed at services, Type 1 SPDs shall be connected to one of the following:

(1) Grounded service conductor

(2) Grounding electrode conductor

(3) Grounding electrode for the service

(4) Equipment grounding terminal in the service equipment

Statement of Problem and Substantiation for Public Input

Is there a good reason a type 1 SPD can be allowed on the line side of a service (where it may be difficult to replace) but not allowed on the secondary side of a separately derived system (where the customer is more likely to have access to a disconnect for the line side of that system's transformer)? If there's no good reason then it would seem if they can be installed on the line side of a service, they should also be allowed on the line side of a separately derived system.

Submitter Information Verification

Submitter Full Name: Josh Weaver
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Thu Mar 23 20:21:06 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9238-NFPA 70-2024

Statement: In order to eliminate confusion of where Type 1 SPDs can be installed, it has been clarified they are permitted to be installed in any location not prohibited by the manufacturer's installation instructions.

Public Input No. 4540-NFPA 70-2023 [New Section after 242.13(B)]

(C) SPDs attached to locations B.2, B.3 or B.4 require a ground impedance of 25 ohms or less.

Informational Note No. 1: During the installation of common mode Surge Protective Devices (SPDs) in electrical systems, it is imperative to conduct this verification to ensure the safe operation of the SPDs conductive path. Impedance to be verified by fall of potential measurement or use of a clamp-on resistance tester.

-

Statement of Problem and Substantiation for Public Input

Alignment with NFPA 780: NFPA 780 A.4.19.2.13 emphasizes the effectiveness of a common mode SPD hinges on the impedance of the path to ground. It underscores that lower impedance reduces voltage disparities between conductors connected to SPDs near the service entrance, thereby reducing the potential for arcing or insulation breaches.

"A.4.19.2.13
The effectiveness of of the SPD is based on the impedance of the path to ground. A lower impedance minimizes the voltage differences of conductors attached to SPDs near the service entrance and reduces the chance of arcing or insulation breaches. Consequently, it is essential to minimize impedance in this circuit."

Consistency with Industry Standards: This proposal aligns with recognized industry standards and best practices, accentuating the significance of proper grounding when utilizing common mode SPDs.

- The NEC specifies 25 ohms as an acceptable limit for electrode impedance.

Proper ground impedance is necessary for common mode SPDs to effectively mitigate surge currents, safeguarding equipment and infrastructure from transient voltage.

Submitter Information Verification

Submitter Full Name: Brett Board
Organization: Blue Line Logic
Street Address:
City:
State:
Zip:

Submittal Date: Tue Sep 12 09:05:25 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: There is no need to correlate with NFPA 780, as not all SPDs are intended to be part of a lightning protection system. There was no technical substantiation provided on why a 25 ohms or less ground impedance is necessary for SPDs. Also, the proposed informational note includes requirements, which is not permitted per section 2.1.10.2 of the NEC Style Manual.

Public Input No. 835-NFPA 70-2023 [Section No. 242.14]

242.14 Type 2 SPDs.

Type 2 SPDs shall be installed in accordance with 242.14(A) ~~through (~~ , (B), or (C).

(A) Service-Supplied Building or Structure.

Type 2 SPDs shall be connected anywhere on the load side of a service disconnect ~~overcurrent device~~ overcurrent device required in 230.91 unless installed in accordance with 230.82(8).

(B) Feeder-Supplied Building or Structure.

Type 2 SPDs shall be ~~connected at the building or structure anywhere on the~~ connected on the load side of any of the ~~first~~ overcurrent ~~device~~ devices at the building or structure.

(C) Separately Derived System.

The SPD shall be connected on the load side of the ~~first~~ overcurrent device in a separately derived system.

Statement of Problem and Substantiation for Public Input

This public input clarifies the following:

1) Conditions (A), (B), and (C) are mutually exclusive, but current text "installed in accordance with 242.12(A) through (C)" implies the opposite. "(A) through (C)" is being replaced by "(A), (B), or (C)".
2) The word "first" is being deleted from (B) and (C) to clarify the Type 2 SPD shall be connected on the load side of any of the overcurrent devices supplied by the feeder or separately derived system. All circuit breakers installed in a Sub-panels or mains-lug panelboard are connected/fed by the same feeder, therefore there is not a "first" overcurrent device since they are electrically all in parallel. "First" can be misinterpreted as physical position/space number 1 in the panel.

Submitter Information Verification

Submitter Full Name: Frank Tse
Organization: Hubbell Incorporated
Street Address:
City:
State:
Zip:
Submittal Date: Tue May 16 16:35:41 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-9242-NFPA 70-2024

Statement: Section 242.14 has been updated to clarify that when a Type 2 SPD is installed, any of the options A, B, or C are permitted. Previous Code language indicated that all three items (A, B, and C) are required for Type 2 SPDs. The existing language is clear that the Type 2 SPD may be installed anywhere on the load side of the first overcurrent device in (B) or (C).

Public Input No. 297-NFPA 70-2023 [Section No. 242.16]

242.16 Type 3 SPDs.

Type 3 SPDs shall be permitted to be installed on the load side of branch-circuit overcurrent protection up to the equipment served. If ~~included in~~ the manufacturer's instructions includes a cautionary warning that limits the Type 3 SPD proximity of the conductor distance from the service or separately derived system disconnect , the Type 3 SPD connection shall be a minimum 10 m (30 ft) of conductor distance from the service or separately derived system disconnect.

Statement of Problem and Substantiation for Public Input

• The last sentence violates 3.2.5.4 of the NEC® Style Manual: "Requirements for guarding shall be stated in AS COMPLETE a manner as possible ...". This sentence would be barely understood by a Manufacturer Member or Regulatory/Testing Member only if they were aware of the product safety Standard's instructions content and not understood by other readers of the Code.
• The conditional clause of last sentence is a SUBJECT NOUN "sandwich" shy of an English As A FIRST Language "picnic". If WHAT is included?
• The Type I conditional sentence form: "if" + Simple Present, Future Conditional
• UL Standard UL 1449 states:
» 85.4 Type 3 SPDs shall be marked on the unit, a marking tag, or an instruction sheet packed with the unit – "CAUTION – Do not install this device if there is not at least 10 meters (30 feet) or more of wire between the electrical outlet and the electrical service panel."
Exception: Type 3 SPDs that have been subjected to the Nominal Discharge Current Test need not be provided with this marking. «

Submitter Information Verification

Submitter Full Name:	Brian Rock
Organization:	Hubbell Incorporated
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Feb 08 04:51:01 EST 2023
Committee:	NEC-P10

Committee Statement

Resolution: The existing text already refers to the manufacturer's instructions. There is no need to revise the language. Manufacturer's instructions are required by the listing, and all SPDs are required to be listed per proposed 242.2 (current 242.6).

Public Input No. 336-NFPA 70-2023 [Section No. 242.22]

242.22 Location.

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

Informational Note: Energized parts of listed receptacle, cord-connected, and direct-plug-in Type 3 SPDs, as installed or used in accordance with manufacturer's instructions, are evaluated to be inaccessible to unqualified persons. See ANSI/UL 1449, *Surge Protective Devices* , which establishes the performance criteria and construction criteria.

Statement of Problem and Substantiation for Public Input

Type 3 SPDs are required to be listed. Listed Type 3 SPDs inherently are evaluated to be accessible safely by unqualified persons.

.

ANSI/UL 1449, Surge Protective Devices, includes the following criteria to evaluate the energized parts of receptacle, cord-connected, and direct-plug-in Type 3 SPDs to be inaccessible, as installed:

.

» 1.18 A cord-connected SPD employing more than two receptacles shall also comply with the applicable requirements in the requirements in the Standard for Relocatable Power Taps, UL 1363 or the Standard for Furniture Power Distribution Units, UL 962A. «

.

» 7.2 Type 3 SPD cord-connected
7.2.1 General
7.2.1.2 An opening in an enclosure shall have such size and shape – or shall be so covered by screening or barrier or by an expanded, perforated, or louvered panel – that a test rod having a diameter of 1.6 mm (1/16 inch) shall be prevented from contacting uninsulated current-carrying parts. Accessibility shall be evaluated by performing the enclosure accessibility test in 67.1.«

.

» 67 Accessibility Tests
67.1 Enclosure accessibility test
67.1.1 The enclosure of a cord-connected Type 3 SPD shall be subjected to the test in 67.1.2. As a result of the test, the test probe shall not contact any uninsulated current-carrying parts.
67.1.2 A straight test rod having a maximum diameter of 1.6 mm (1/16 inch) and of any convenient length is to be inserted into each opening in the enclosure and rotated in any possible direction. «

.

» 1.17 A direct plug-in SPD employing more than two receptacles shall also comply with the applicable requirements in the Standard for Current Taps and Adapters, UL 498A.«

.

» 7.3 Type 3 SPD direct plug-in
7.3.1 General
7.3.1.1 The enclosure shall comply with the enclosure requirements in the Standard for Current Taps and Adapters, UL 498A, ... «

.

ANSI/UL 498A, Current Taps and Adapters:
» 11.1.4 In order to judge the accessibility of a live or dead-metal part, the probe shown in Figure 11.1 [articulate finger probe] is to be applied to the device with a force of 13 N (3 lbf) to any depth that recessing will permit. The probe is to be rotated, changed in configuration, or angled before, during, and after application to any position that is necessary to examine the device. A live or dead-metal part is determined to be accessible when:
a) The part is contacted by the probe, or
b) The part is located in a hole larger than 7.1 mm (9/32 inch) in diameter and recessed less than 4.8 mm (3/16 inch). «

.

ANSI/UL 1449, Surge Protective Devices:
» 16 Receptacles
16.1 The receptacle outlets shall comply with the applicable requirements in the Standard for Attachment Plugs and Receptacles, UL 498 and in accordance with Wiring Devices – Dimensional Specifications, ANSI/NEMA WD6. «

.

ANSI/UL 498, Attachment Plugs and Receptacles:
» 9.1.4 In order to judge the accessibility of a live or dead-metal part, the device is to be wired and assembled in

accordance with the manufacturer's instructions, except that any nonessential parts (described in 9.1.6) that are able to be opened or removed by the user without using a tool are to be opened or removed. The probe shown in Figure 9.1 [articulate finger probe] is to be applied with a force of not more than 3 lbf (13.3 N) to any depth that recessing will permit. The probe is to be rotated, changed in configuration, or angled before, during, and after application to any position that is necessary to examine the device. A live or dead-metal part is determined to be accessible when:
a) The part is contacted by the probe, or
b) The part is located in a hole larger than 7.1 mm (9/32 inch) in diameter and recessed less than 4.8 mm (3/16 inch). «
.
Although 242.1 Scope does indicate that SPDs covered are "… permanently installed on the premises wiring …", ANSI/ANSI/UL 1449, Surge Protective Devices, does permit means for screw-down attachment of current tap and adapter (both direct-plug-in and corded) Type 3 SPDs to a duplex receptacle's coverplate-mounting threaded screw hole and such attachment might be regarded as being "permanently installed on the premises wiring". (Receptacle Type 3 SPDs of course are permanently installed inherently.) Consequently, explicit inclusion of Type 3 of all three Type 3 SPD embodiments (receptacle, cord-connected, and direct-plug-in) should therefore be reflected in the Informational Note added to provide definitive guidance and to preclude misinterpretation unequivocally.

Submitter Information Verification

Submitter Full Name: Brian Rock
Organization: Hubbell Incorporated
Street Address:
City:
State:
Zip:
Submittal Date: Wed Feb 15 13:50:48 EST 2023
Committee: NEC-P10

Committee Statement

Resolution: The existing text provides appropriate requirements for the accessibility of SPDs. The proposed text does not add clarity to the Code.

Public Input No. 509-NFPA 70-2023 [Section No. 242.22]

242.22 Location.

SPDs shall be permitted to be located indoors or outdoors ~~and~~ . Open type SPDs shall ~~be made inaccessible to unqualified persons unless listed for installation in accessible locations~~ only be installed where enclosed .

Statement of Problem and Substantiation for Public Input

From available manufacturer literature, it seems no manufacturer specifically lists their SPDs to be installed where accessible to unqualified persons. Rather, manufacturers of SPDs not having fully enclosed terminals (such as dinrail mount SPDs) state that their SPDs are "Open" type SPDs which must (like most exposed parts) be installed in an enclosure. This proposal seeks to use what seems to be a more commonly used term.

Submitter Information Verification

Submitter Full Name: Josh Weaver
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Thu Mar 23 20:26:34 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The existing text provides appropriate requirements for the accessibility of SPDs. The proposed text does not add clarity to the Code.

Public Input No. 4314-NFPA 70-2023 [Section No. 408.1]

408.1 Scope.

This article covers switchboards, switchgear, and panelboards. It does not apply to equipment operating at over 1000 volts, except as specifically referenced elsewhere in the *Code*.

Informational Note: See IEEE 3004.11 Recommended Practice for Bus and Switchgear Protection in Industrial and Commercial Power Systems for additional information.

Statement of Problem and Substantiation for Public Input

This is another slice of updated content from the legacy "Red Book" IEEE 141 and "Gray Book: IEEE 241 into the new IEEE 3000 Standards Collection. From the project prospectus:

"Covered in this recommended practice is the protection of bus and switchgear used in industrial and commercial power systems. Also provided are fault protection and isolation strategies for the substation bus and switchgear, including the bus, circuit breakers, fuses, disconnecting devices, transformers, and the structures on which they are mounted."

https://standards.ieee.org/standard/3004_11-2019.html

Submitter Information Verification

Submitter Full Name: Michael Anthony
Organization: Standards Michigan LLC
Affiliation: IEEE Industrial Applications Society
Street Address:
City:
State:
Zip:

Submittal Date: Thu Sep 07 10:57:45 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The proposed Informational Note does not improve usability of the code in accordance with NEC Style Manual 2.1.10.1.

Public Input No. 2608-NFPA 70-2023 [Section No. 408.2]

408. ~~2~~ 3 Reconditioned Equipment.

The use of reconditioned equipment within the scope of this article shall be limited as described in 408.~~2~~ 3 (A) and (B). If equipment has been damaged by fire, products of combustion, corrosive influences, or water, it shall be specifically evaluated by its manufacturer or a qualified testing laboratory prior to being returned to service.

~~**(B)** Switchboards and Switchgear.~~

(A) ~~Panelboards.~~

~~Reconditioned panelboards shall not be permitted.~~

Permitted to be Installed.

Reconditioned switchboards and switchgear, or sections of switchboards or switchgear, shall be permitted to be installed .

(B) Not Permitted to be Installed.

Reconditioned panelboards shall not be installed.

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. The text is revised to comply with the NEC Style Manual Section 2.2.1 regarding reconditioned equipment.
2.2.1 Parallel Numbering Required. Technical committees shall use the following section numbers for the same purposes within articles. This requirement shall not apply to Articles 90, 100, and 110. If the article does not contain listing or reconditioning requirements, the subdivisions shall not be included in the article.
Required Parallel Numbering Format
XXX.1 Scope.
XXX.2 Listing Requirements.
XXX.3 Reconditioned Equipment.
XXX.3(A) Permitted to be Installed.
XXX.3(B) Not Permitted to be Installed.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 23 19:58:51 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-8938-NFPA 70-2024

Statement: Reconditioned equipment has been relocated to 408.3, as required per section 2.2.1 of the NEC Style Manual. (A) and (B) were also revised to comply with the NEC Style Manual.

Public Input No. 3717-NFPA 70-2023 [Section No. 408.2]

408.~~2~~ 3 Reconditioned Equipment.

The use of reconditioned equipment within the scope of this article shall be limited as described in 408.2(A) and (B). If equipment has been damaged by fire, products of combustion, corrosive influences, or water, it shall be specifically evaluated by its manufacturer or a qualified testing laboratory prior to being returned to service.

(A) Panelboards.

Reconditioned panelboards shall not be permitted.

(B) Switchboards and Switchgear.

Reconditioned switchboards and switchgear, or sections of switchboards or switchgear, shall be permitted.

Statement of Problem and Substantiation for Public Input

The section should be relocated to 408.3 for compliance with the NEC Style Manual Section 2.2.1.

Submitter Information Verification

Submitter Full Name: Derrick Atkins
Organization: Minneapolis Electrical JATC
Street Address:
City:
State:
Zip:
Submittal Date: Tue Sep 05 14:41:58 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-8938-NFPA 70-2024
Statement: Reconditioned equipment has been relocated to 408.3, as required per section 2.2.1 of the NEC Style Manual. (A) and (B) were also revised to comply with the NEC Style Manual.

Public Input No. 3714-NFPA 70-2023 [Section No. 408.3]

408.~~3~~ XX Support and Arrangement of Busbars and Conductors.

(A) Conductors and Busbars on a Switchboard, Switchgear, or Panelboard.

Conductors and busbars on a switchboard, switchgear, or panelboard shall comply with 408.3(A)(1) and (A)(2) as applicable.

(1) Location.

Conductors and busbars shall be located so as to be free from physical damage and shall be held firmly in place.

(2) Same Vertical Section.

Other than the required interconnections and control wiring, only those conductors that are intended for termination in a vertical section of a switchboard or switchgear shall be located in that section.

Exception: Conductors shall be permitted to travel horizontally through vertical sections of switchboards and switchgear where such conductors are isolated from busbars by a barrier.

(B) Overheating and Inductive Effects.

The arrangement of busbars and conductors shall be such as to avoid overheating due to inductive effects.

(C) Used as Service Equipment.

Each switchboard, switchgear, or panelboard, if used as service equipment, shall be provided with a main bonding jumper sized in accordance with 250.28(D) or the equivalent placed within the panelboard or one of the sections of the switchboard or switchgear for connecting the grounded service conductor on its supply side to the switchboard, switchgear, or panelboard frame. All sections of a switchboard or switchgear shall be bonded together using an equipment-bonding jumper or a supply-side bonding jumper sized in accordance with 250.122 or 250.102(C)(1) as applicable.

Exception: Switchboards, switchgear, and panelboards used as service equipment on high-impedance grounded neutral systems in accordance with 250.36 shall not be required to be provided with a main bonding jumper.

(D) Terminals.

In switchboards and switchgear, load terminals for field wiring shall comply with 408.18(C).

(E) Bus Arrangement.

(1) AC Phase Arrangement.

Alternating-current phase arrangement on 3-phase buses shall be A, B, C from front to back, top to bottom, or left to right, as viewed from the front of the switchboard, switchgear, or panelboard. The B phase shall be that phase having the higher voltage to ground on 3-phase, 4-wire, delta-connected systems. Other busbar arrangements shall be permitted for additions to existing installations and shall be marked.

Exception: Equipment within the same single section or multisection switchboard, switchgear, or panelboard as the meter on 3-phase, 4-wire, delta-connected systems shall be permitted to have the same phase configuration as the metering equipment.

Informational Note: See 110.15 for requirements on marking the busbar or phase conductor having the higher voltage to ground where supplied from a 4-wire, delta-connected system.

(2) DC Bus Arrangement.

Direct-current ungrounded buses shall be permitted to be in any order. Arrangement of dc buses shall be field marked as to polarity, grounding system, and nominal voltage.

(F) Switchboard, Switchgear, or Panelboard Identification.

A caution sign(s) or a label(s) provided in accordance with 408.3(F)(1) through (F)(5) shall comply with 110.21(B).

(1) High-Leg Identification.

A switchboard, switchgear, or panelboard containing a 4-wire, delta-connected system where the midpoint of one phase winding is grounded shall be legibly and permanently field marked as follows:

CAUTION _____ PHASE HAS _____ VOLTS TO GROUND

(2) Ungrounded AC Systems.

A switchboard, switchgear, or panelboard containing an ungrounded ac electrical system as permitted in 250.21 shall be legibly and permanently field marked as follows:

CAUTION UNGROUNDED SYSTEM OPERATING — _____ VOLTS BETWEEN CONDUCTORS

(3) High-Impedance Grounded Neutral AC System.

A switchboard, switchgear, or panelboard containing a high-impedance grounded neutral ac system in accordance with 250.36 shall be legibly and permanently field marked as follows:

CAUTION: HIGH-IMPEDANCE GROUNDED NEUTRAL AC SYSTEM OPERATING — _____ VOLTS BETWEEN CONDUCTORS AND MAY OPERATE — _____ VOLTS TO GROUND FOR INDEFINITE PERIODS UNDER FAULT CONDITIONS

(4) Ungrounded DC Systems.

A switchboard, switchgear, or panelboard containing an ungrounded dc electrical system in accordance with 250.169 shall be legibly and permanently field marked as follows:

CAUTION: UNGROUNDED DC SYSTEM OPERATING — _____ VOLTS BETWEEN CONDUCTORS

(5) Resistively Grounded DC Systems.

A switchboard, switchgear, or panelboard containing a resistive connection between current-carrying conductors and the grounding system to stabilize voltage to ground shall be legibly and permanently field marked as follows:

CAUTION: DC SYSTEM OPERATING — _____ VOLTS BETWEEN CONDUCTORS AND MAY OPERATE — _____ VOLTS TO GROUND FOR INDEFINITE PERIODS UNDER FAULT CONDITIONS

(G) Minimum Wire-Bending Space.

The minimum wire-bending space at terminals and minimum gutter space provided in switchboards, switchgear, and panelboards shall be as required in 312.6.

Statement of Problem and Substantiation for Public Input

The section should be relocated for compliance with the NEC Style Manual Section 2.2.1.

Submitter Information Verification

Submitter Full Name: Derrick Atkins
Organization: Minneapolis Electrical JATC
Street Address:
City:
State:
Zip:

Submittal Date: Tue Sep 05 14:41:05 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-8946-NFPA 70-2024

Statement: The requirements of 408.3 are relocated to 408.10 to comply with the NEC Style Manual 2.2.1.

Public Input No. 2071-NFPA 70-2023 [Section No. 408.3(C)]

(C) Used as Service Equipment.

Each switchboard, switchgear, or <u>enclosed</u> panelboard, if used as service equipment, shall be provided with a main bonding jumper sized in accordance with 250.28(D) or the equivalent placed within the <u>enclosed</u> panelboard or one of the sections of the switchboard or switchgear for connecting the grounded service conductor on its supply side to the switchboard, switchgear, or <u>enclosed</u> panelboard frame. All sections of a switchboard or switchgear shall be bonded together using an equipment-bonding jumper or a supply-side bonding jumper sized in accordance with 250.122 or 250.102(C)(1) as applicable.

Exception: Switchboards, switchgear, and panelboards used as service equipment on high-impedance grounded neutral systems in accordance with 250.36 shall not be required to be provided with a main bonding jumper.

Statement of Problem and Substantiation for Public Input

The term ‘panelboard’ and ‘enclosed panelboard’ are defined terms. Adding the word ‘enclosed panelboard’ makes the text technically correct. Note: The term ‘Enclosed Panelboard’ was added to NEC Article 100 during the 2023 Code cycle.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:

Submittal Date: Fri Aug 11 15:13:04 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The use of the term panelboard permits for an open-style or enclosed-type panelboard and adding the word ‘enclosed’ would cause the requirement to not be applicable where open panelboards are installed.

Public Input No. 237-NFPA 70-2023 [Section No. 408.3(F)]

(F) Switchboard, Switchgear, or Panelboard Identification.

A caution sign(s) or a label(s) provided in accordance with 408.3(F)(1) through (F)(5) shall comply with 110.21(B).

(1) High-Leg Identification.

A switchboard, switchgear, or panelboard enclosure containing a 4-wire, delta-connected system where the midpoint of one phase winding is grounded shall be legibly and permanently field marked in an approved location on the exterior of the enclosure as follows:

CAUTION _____ PHASE HAS _____ VOLTS TO GROUND

(2) Ungrounded AC Systems.

A switchboard, switchgear, or panelboard enclosure containing an ungrounded ac electrical system as permitted in 250.21 shall be legibly and permanently field marked ~~as~~ in an approved location on the exterior of the enclosure as follows:

CAUTION UNGROUNDED SYSTEM OPERATING — _____ VOLTS BETWEEN CONDUCTORS

(3) High-Impedance Grounded Neutral AC System.

A switchboard, switchgear, or panelboard enclosure containing a high-impedance grounded neutral ac system in accordance with 250.36 shall be legibly and permanently field marked ~~as~~ in an approved location on the exterior of the enclosure as follows:

CAUTION: HIGH-IMPEDANCE GROUNDED NEUTRAL AC SYSTEM OPERATING — _____ VOLTS BETWEEN CONDUCTORS AND MAY OPERATE — _____ VOLTS TO GROUND FOR INDEFINITE PERIODS UNDER FAULT CONDITIONS

(4) Ungrounded DC Systems.

A switchboard, switchgear, or panelboard enclosure containing an ungrounded dc electrical system in accordance with 250.169 shall be legibly and permanently field marked ~~as~~ in an approved location on the exterior of the enclosure as follows:

CAUTION: UNGROUNDED DC SYSTEM OPERATING — _____ VOLTS BETWEEN CONDUCTORS

(5) Resistively Grounded DC Systems.

A switchboard, switchgear, or panelboard enclosure containing a resistive connection between current-carrying conductors and the grounding system to stabilize voltage to ground shall be legibly and permanently field marked ~~as~~ in an approved location on the exterior of the enclosure as follows:

CAUTION: DC SYSTEM OPERATING — _____ VOLTS BETWEEN CONDUCTORS AND MAY OPERATE — _____ VOLTS TO GROUND FOR INDEFINITE PERIODS UNDER FAULT CONDITIONS

Statement of Problem and Substantiation for Public Input

I do not believe the intent is to mark the panelboard (busbars) itself! I believe the intent is to mark the equipment enclosures. The location of this marking should be in a location visible on the exterior of the enclosure so covers don't need to be removed to find this marking! Putting this marking behind removable covers does not make much sense. It would be much safer to warn installers without the need for removing covers!

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 238-NFPA 70-2023 [Section No. 408.5]	
Public Input No. 239-NFPA 70-2023 [Section No. 550.10(B)]	
Public Input No. 240-NFPA 70-2023 [Section No. 552.43(B)]	

Public Input No. 241-NFPA 70-2023 [Section No. 250.32(D)]

Submitter Information Verification

Submitter Full Name: Russ Leblanc
Organization: Leblanc Consulting Services
Street Address:
City:
State:
Zip:
Submittal Date: Sat Jan 28 11:00:08 EST 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-8952-NFPA 70-2024

Statement: The added language increases clarity of where field marking can be added for enclosures. However, the word ‘enclosure’ after the word ‘panelboard’ in the proposed changes were not accepted since such language is redundant.

Public Input No. 2072-NFPA 70-2023 [Section No. 408.4(A)]

(A) Circuit Directory or Circuit Description.

Every circuit and circuit modification shall be provided with a legible and permanent description that complies with all of the following conditions as applicable:

(1) Located at each switch or circuit breaker in a switchboard or switchgear

(2) Included in a circuit directory that is located on the face of, inside of, or in an approved location adjacent to the panel door in the case of a enclosed panelboard

(3) Clear, evident, and specific to the purpose or use of each circuit including spare positions with an unused overcurrent device

(4) Described with a degree of detail and clarity that is unlikely to result in confusion between circuits

(5) Not dependent on transient conditions of occupancy

(6) Clear in explaining abbreviations and symbols when used

Statement of Problem and Substantiation for Public Input

The term ‘panelboard’ and ‘enclosed panelboard’ are defined terms. Adding the word ‘enclosed panelboard’ makes the text technically correct. Note: The term ‘Enclosed Panelboard’ was added to NEC Article 100 during the 2023 Code cycle.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Fri Aug 11 15:15:21 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The addition of the word 'enclosed' is not necessary and does not add clarity and usability to the code.

Public Input No. 3202-NFPA 70-2023 [Section No. 408.4(B)]

(B) Source of Supply.

All switchboards, switchgear, and panelboards supplied by a feeder(s) in other than one- or two-family dwellings shall be permanently marked in accordance with the following:

(1) With the identification and physical location of where the power originates

(2) ~~With a label that is permanently affixed and of sufficient durability to withstand the environment involved~~

(3) ~~Using a method that is not handwritten~~

(4)

(5)

Statement of Problem and Substantiation for Public Input

Unnecessary language that is already required by 110.21 (B)

Submitter Information Verification

Submitter Full Name: Beau Burton
Organization: Metropolitan Detroit Electrical Industry Training Center
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 30 10:57:24 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The label requirements in 408.4(B) are not a caution or warning sign and is not required in accordance with 110.21(B).

Public Input No. 238-NFPA 70-2023 [Section No. 408.5]

408.5 Clearance for Conductor Entering Bus Enclosures.

Where conduits or other raceways enter a switchboard, switchgear, floor-standing panelboard enclosure , or similar enclosure at the bottom, approved space shall be provided to permit installation of conductors in the enclosure. The wiring space shall not be less than shown in Table 408.5 where the conduit or raceways enter or leave the enclosure below the busbars, their supports, or other obstructions. The conduit or raceways, including their end fittings, shall not rise more than 75 mm (3 in.) above the bottom of the enclosure.

Table 408.5 Clearance for Conductors Entering Bus Enclosures

Conductor	Minimum Spacing Between Bottom of Enclosure and Busbars, Their Supports, or Other Obstructions	
	mm	in.
Insulated busbars, their supports, or other obstructions	200	8
Noninsulated busbars	250	10

Statement of Problem and Substantiation for Public Input

The conduits, raceways, and cables really enter the panelboard ENCLOSURE, rather than the panelboard (busbars) itself. The revision clarifies the intent.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 237-NFPA 70-2023 [Section No. 408.3(F)]	panelboard enlcosure vs panelboard busbars
Public Input No. 235-NFPA 70-2023 [Section No. 424.47]	panelboard enclosures vs panelboard busbars
Public Input No. 239-NFPA 70-2023 [Section No. 550.10(B)]	
Public Input No. 240-NFPA 70-2023 [Section No. 552.43(B)]	
Public Input No. 241-NFPA 70-2023 [Section No. 250.32(D)]	

Submitter Information Verification

Submitter Full Name: Russ Leblanc
Organization: Leblanc Consulting Services
Street Address:
City:
State:
Zip:

Submittal Date: Sat Jan 28 11:09:16 EST 2023
Committee: NEC-P10

Committee Statement

Resolution: The proposed change is unnecessary. The text of 408.5 already clearly states that the required space must be provided in the enclosure.

Public Input No. 3423-NFPA 70-2023 [Section No. 408.6]

408.6 Short-Circuit Current Rating.

Switchboards, switchgear, and panelboards shall have a short-circuit current rating not less than the available fault current. In other than one- and two-family dwelling units, the available fault current and the date the calculation was performed shall be field marked on the enclosure ~~at the point of supply. The marking~~ . These markings shall comply with 110.21(B)(~~3~~ 1). The calculation shall be documented and made available to those authorized to inspect, install, or maintain the installation.

Statement of Problem and Substantiation for Public Input

This public input is an editorial revision to clarify the available fault current marking requirement:

1. The terms "at the point of supply" being at the end of the sentence implies it refers to the required location of the field
marking rather than where the available fault current calculation is made. This revision corrects this misreading of the section
by deleting "at the point of supply" as this adds no value to the rule and may also result in motor contribution or other load
characteristics from not being included in the calculation in addition to the available fault current at the point of supply to the
equipment.

2. 110.21(B) no longer has three list items so "(3)" is deleted. The marking requirement in this section should comply with all of
the requirements in 110.21(B)(1) as the requirements in list item (3) were relocated to this list item.

3. The new sentence requiring the calculation to be documented and made available aligns this section with 110.24(A),
409.22(B), 430.99, and 440.10. Having this calculation documented and made available for switchboards, switchgear, and
panelboards is as important as it is for service equipment, industrial control panels, motor control centers, and air conditioning
and refrigerating equipment.

Submitter Information Verification

Submitter Full Name:	Megan Hayes
Organization:	NEMA
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Sat Sep 02 18:52:54 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: FR-8961-NFPA 70-2024

Statement: The section was restructured to move the requirements into an itemized list for readability.

The new item (2) was added to require that marking shall be required in a readily accessible location on the equipment which indicates the short circuit rating of the equipment. This change will aid individuals trying to determine the short circuit rating of equipment. A new item (4) was added to require the fault current calculation to be documented and made available to align this section with 110.24(A), 409.22(B), 430.99, and 440.10. Having this calculation documented and made available for switchboards, switchgear, and panelboards is as important as it is for service equipment, industrial control panels, motor control centers, and air conditioning and refrigerating equipment. The new item (5) was added to align with section 110.24(B) when modifications to the installation are made. New item (6) was added for clarification regarding the required short circuit rating of equipment when adding overcurrent devices. Lastly, an informational note was added for direction regarding series combination systems.

Public Input No. 3905-NFPA 70-2023 [Section No. 408.6]

408.6 Short-Circuit Current Rating.

Switchboards, switchgear, and panelboards shall have a short-circuit current rating not less than the available fault current. In other than one- and two-family dwelling units, the following shall be field marked on the enclosure where it is visible after installation:

(1) The available fault current and the date the calculation was performed.

(2) The short-circuit current rating of the equipment, at nominal circuit voltage, based on the lowest overcurrent protective device interrupting rating installed.

Exception No. 1: Where switchboards, switchgear or panelboards are factory marked with a short-circuit current rating that does not vary based on the devices installed an additional field marked short-circuit rating shall not be ~~field marked on the enclosure at the point of supply. The marking~~ *required.*

Exception No. 2: For equipment with series rated combinations marked in accordance with 110.22(B) or (C) an additional field marked short-circuit current rating shall not be required.

These markings shall comply with 110.21(B)~~(3)~~ .

Additional Proposed Changes

File Name	Description	Approved
NEC_2026_-_NEC_408.6_Language.docx	Proposed changes for 408.6. The changes in Terra were appearing out of order.	

Statement of Problem and Substantiation for Public Input

Section 110.21(B)(3) referenced has been removed from the 2023 NEC. Ensuring that switchboards, switchgear and panelboards have a short-circuit current rating (SCCR) that is not less than the available fault current is critical to avoid electrical hazards and severe equipment damage. The SCCR of switchgear, switchboards and panelboards is often dependent on the interrupting rating of the overcurrent protective devices (OCPDs) that are installed in the equipment. They can typically accept devices with varying interrupting ratings and the specific OCPDs installed in the field may not be known when the equipment is built at the factory. Additionally, OCPDs may be added after the initial installation that could affect the SCCR of the equipment. In many cases, the interrupting rating of the OCPD may not be visible after installation making the assembly SCCR difficult to determine without removing covers. A field marking of the SCCR will help to ensure the proper installation and will make the inspection of the equipment much simpler and straightforward. It would also help to ensure that OCPDs added after the initial installation have an interrupting rating at least equal to the field marked SCCR. This requirement is similar to the field marking requirements for transfer switches in 700.5(F), 701.5(D), 708.24(F) that have varying short-circuit current ratings that depend on the type of OCPD that is being used to protect the equipment.

Submitter Information Verification

Submitter Full Name: jeremy omess

Organization: Eaton

Street Address:

City:

State:

Zip:

Submittal Date: Wed Sep 06 09:49:49 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: FR-8961-NFPA 70-2024

Statement: The section was restructured to move the requirements into an itemized list for readability.

The new item (2) was added to require that marking shall be required in a readily accessible location on the equipment which indicates the short circuit rating of the equipment. This change will aid individuals trying to determine the short circuit rating of equipment. A new item (4) was added to require the fault current calculation to be documented and made available to align this section with 110.24(A), 409.22(B), 430.99, and 440.10. Having this calculation documented and made available for switchboards, switchgear, and panelboards is as important as it is for service equipment, industrial control panels, motor control centers, and air conditioning and refrigerating equipment. The new item (5) was added to align with section 110.24(B) when modifications to the installation are made. New item (6) was added for clarification regarding the required short circuit rating of equipment when adding overcurrent devices. Lastly, an informational note was added for direction regarding series combination systems.

408.6 Short-Circuit Current Rating.

Switchboards, switchgear, and panelboards shall have a short-circuit current rating not less than the available fault current. In other than one- and two-family dwelling units, the following ~~available fault current and the date the calculation was performed~~ shall be field marked on the enclosure where it is visible after installation ~~at the point of supply~~.

(1) The available fault current and the date the calculation was performed
(2) The short-circuit current rating of the equipment, at nominal circuit voltage, based on the lowest overcurrent protective device interrupting rating installed.
Exception No. 1: Where switchboards, switchgear or panelboards are factory marked with a short-circuit current rating that does not vary based on the devices installed an additional field marked short-circuit current rating shall not be required.
Exception No. 2: For equipment with series rated combinations marked in accordance with 110.22(B) or (C) an additional field marked short-circuit current rating shall not be required.

These markings shall comply with 110.21(B)~~(3)~~.

Public Input No. 4542-NFPA 70-2023 [Section No. 408.6]

408.6 Short-Circuit Current Rating.

Switchboards, switchgear, and panelboards shall have a short-circuit current rating not less than the available fault current. In other than one- and two-family dwelling units, the available fault current and the date the calculation was performed shall be field marked on the enclosure at the point of supply. The marking shall ~~comply with 110.21(B) (3).~~ be of sufficient durability to withstand the environment involved.

Additional Proposed Changes

File Name	Description	Approved
TIA_1699_70_23_12.pdf	NEC TIA No. 23-12 (Log 1699)	

Statement of Problem and Substantiation for Public Input

NOTE: This public input originates from Tentative Interim Amendment No. 23-12 (Log 1699) issued by the Standards Council on August 25, 2023 and per the NFPA Regs., needs to be reconsidered by the Technical Committee for the next edition of the Document.

Substantiation: For NFPA 70 2023 the wording in NFPA 2020 110.21(B)(3) was combined with some of the wording in NFPA 70 2020 110.21(B)(1). 110.21(B)(3) does not exist in NFPA 70 2023 but the required wording is a part of 110.21(B)(1). This change adds the required wording from NFPA 2020 to 408.6 and removes the reference to 110.21(B)(3).

Emergency Nature: The standard contains an error or an omission that was overlooked during the regular revision process. The proposed TIA intends to correct a circumstance in which the revised NFPA Standard has resulted in an adverse impact on a product or method that was inadvertently overlooked in the total revision process or was without adequate technical (safety) justification for the action.

The standard contains an error that was overlooked during the regular revision process. This TIA corrects the error by removing a technical requirement regarding the marking that was not intended or required.

Submitter Information Verification

Submitter Full Name: CMP on NEC-P09
Organization: Code-Making Panel 9
Street Address:
City:
State:
Zip:
Submittal Date: Tue Sep 12 19:02:37 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-8961-NFPA 70-2024

Statement: The section was restructured to move the requirements into an itemized list for readability.

The new item (2) was added to require that marking shall be required in a readily accessible location on the equipment which indicates the short circuit rating of the equipment. This change will aid individuals trying to determine the short circuit rating of equipment. A new item (4) was added to require the fault current calculation to be documented and made available to align this section with 110.24(A), 409.22(B), 430.99, and 440.10. Having this calculation documented and made available for switchboards, switchgear, and panelboards is as important as it is for service equipment, industrial control panels, motor control centers, and air conditioning and refrigerating equipment. The new item (5) was added to align with section 110.24(B) when modifications to the installation are made. New item (6) was added for clarification regarding the required short circuit rating of equipment when adding overcurrent devices. Lastly, an informational note was added for direction regarding series combination systems.

Tentative Interim Amendment

NFPA® 70®

National Electrical Code®

2023 Edition

Reference: 408.6
TIA 23-12
(SC 23-8-56 / TIA Log #1699)

Pursuant to Section 5 of the NFPA *Regulations Governing the Development of NFPA Standards*, the National Fire Protection Association has issued the following Tentative Interim Amendment to NFPA 70®, *National Electrical Code®*, 2023 edition. The TIA was processed by Code-Making Panel 9 and the Correlating Committee on National Electrical Code, and was issued by the Standards Council on August 25, 2023, with an effective date of September 14, 2023.

1. Revise 408.6 to read as follows:

408.6 Short-Circuit Current Rating. Switchboards, switchgear, and panelboards shall have a short-circuit current rating not less than the available fault current. In other than one- and two-family dwelling units, the available fault current and the date the calculation was performed shall be field marked on the enclosure at the point of supply. The marking shall be of sufficient durability to withstand the environment involved. ~~comply with 110.21(B)(3).~~

Issue Date: August 25, 2023

Effective Date: September 14, 2023

(Note: For further information on NFPA Codes and Standards, please see www.nfpa.org/docinfo)

Public Input No. 496-NFPA 70-2023 [Section No. 408.6]

408.6 Short-Circuit Current Rating.

Switchboards, switchgear, and panelboards shall have a short-circuit current rating not less than the available fault current. In other than one- and two-family ~~dwelling units~~ dwellings , the available fault current and the date the calculation was performed shall be field marked on the enclosure at the point of supply. The marking shall comply with 110.21(B)(3).

Statement of Problem and Substantiation for Public Input

The use of the words "one- and two-family dwelling units" conflicts with the provided definitions of one-family dwelling, two-family dwellings and dwelling unit and is confusing on what this should apply to.

Submitter Information Verification

Submitter Full Name: Albin Kneggs
Organization: City of Dallas
Street Address:
City:
State:
Zip:

Submittal Date: Tue Mar 21 13:44:16 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-8961-NFPA 70-2024

Statement: The section was restructured to move the requirements into an itemized list for readability.

The new item (2) was added to require that marking shall be required in a readily accessible location on the equipment which indicates the short circuit rating of the equipment. This change will aid individuals trying to determine the short circuit rating of equipment. A new item (4) was added to require the fault current calculation to be documented and made available to align this section with 110.24(A), 409.22(B), 430.99, and 440.10. Having this calculation documented and made available for switchboards, switchgear, and panelboards is as important as it is for service equipment, industrial control panels, motor control centers, and air conditioning and refrigerating equipment. The new item (5) was added to align with section 110.24(B) when modifications to the installation are made. New item (6) was added for clarification regarding the required short circuit rating of equipment when adding overcurrent devices. Lastly, an informational note was added for direction regarding series combination systems.

Public Input No. 775-NFPA 70-2023 [Section No. 408.6]

~~**408.6** Short-Circuit Current Rating.~~

~~Switchboards, switchgear, and panelboards shall have a short-circuit current rating not less than the available fault current. In other than one- and two-family dwelling units, the available fault current and the date the calculation was performed shall be field marked on the enclosure at the point of supply. The marking shall comply with 110.21(B) (3).~~

Statement of Problem and Substantiation for Public Input

The requirement for equipment to withstand fault current is already a general requirement of 110.10. There is no need to repeat it here.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 776-NFPA 70-2023 [Section No. 110.24]	

Submitter Information Verification

Submitter Full Name:	Eric Stromberg
Organization:	Los Alamos National Laboratory
Affiliation:	Self
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Sun May 07 11:31:22 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: The requirements of 110.9 and 110.10 apply generally to equipment. However, specific requirements regarding fault current ratings of switchboards, switchgear, and panelboards, as well as required markings, are important to be clarified in article 408.

Public Input No. 955-NFPA 70-2023 [Section No. 408.6]

408.6 Short-Circuit Current Rating.

Switchboards, switchgear, and panelboards shall have a short-circuit current rating not less than the available fault current. ~~In other than one- and two-family dwelling units, the~~ The available fault current and the date the calculation was performed shall be field marked on the enclosure at the point of supply. The marking shall comply with 110.21(B)(3).

Statement of Problem and Substantiation for Public Input

Building electrification has been deemed a key component of the efforts to combatting climate change by shifting away from fossil fuel supplied energy sources. Major cities had already passed legislations banning gas burning appliances starting with furnaces, stoves and ovens, with more expected. In order to support the shift, both load centers and transformers will need to increase in capacity, as evident by the increased availability of 400A rated load centers and up to 75KVA transformers. With increased transformer capacity, almost doubling from the typical 45KVA, there is real concern that the available short circuit current at the service equipment will exceed the commonly accepted 10KA maximum value and can be as high as 15KA. Main and branch type circuit breakers are typically rated for 10KA, but the basic UL standard rating is only 5KA. According to the 2022 NFPA Home Electrical Fires report (Table 5), the "Panelboard, Switchboard, circuit breaker board" category ranked third highest, in the "Wiring and related equipment" category, in Equipment Involved in Ignition causing 1360 fires, 10 civilian deaths, 20 civilian injuries and $51 million direct property damage annually. It ranks highest among equipment with no more than one installed per dwelling unit, such as service supply wires from utility, electric meter/meter box. When factoring in the number of devices installed per dwelling unit, the panelboard category would have the highest probably of causing fires in the "Wiring and related equipment" category.

The intent of section 408.6 is reduce fires by making sure installed equipment are suitably rated. Field marking available short circuit currents on all service equipment is the only method to ensure the equipment and the overcurrrent protection devices are suitably rated. There is no safety reason to only limit such requirement to other than single- and two-family dwellings.

Submitter Information Verification

Submitter Full Name: Frank Tse
Organization: Hubbell Incorporated
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jun 05 15:00:53 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The first sentence of Section 408.6 already requires panelboards to have a short-circuit current rating not less than the calculated fault current. Dwelling units are not exempt from that requirement. Sufficient substantiation has not been provided to justify requiring the field marking on one-and two-family dwelling services.

Public Input No. 1244-NFPA 70-2023 [New Section after 408.9]

TITLE OF NEW CONTENT

Type your content here ...

408.10. Cybersecurity

Switchboards, switchgear, and panelboards that are connected to a communication network and have the capability to be controlled or permit control of any portion of the premises shall comply with either of the following:

(1) The ability to control the system is limited to a direct connection through a local nonnetworked interface.

(2) The switchboard, switchgear, and panelboard is connected through a networked interface complying with both of the following methods:

a. The switchboard, switchgear, and panelboard and associated software are identified as being evaluated for cybersecurity.

b. A cybersecurity assessment is conducted on the connected system to determine vulnerabilities to cyber attacks.

The cybersecurity assessment shall be conducted when the system configuration changes and at not more than 5-year intervals.

Documentation of the evaluation, assessment, identification, 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 Standards series; and the NIST Framework for Improving Critical Infrastructure Cybersecurity, Version 1.1, for assessment guidelines.

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

Statement of Problem and Substantiation for Public Input

Most of the cybersecurity focus has been on IT systems. There has been very little public discussion about cybersecurity for Operational Technology (OT), but cyber attacks on OT, by both domestic and foreign actors, occur on almost a daily basis. Hackers can easily destroy unprotected equipment and shut down entire unprotected facilities. Our adversaries such as Russia, China, North Korea, and Iran, are continuously mounting cyber attacks. They understand their limits and, so far, prohibit catastrophic attacks on our financial/banking system and electrical grid. In the mean time, they attack our infrastructure, such as the southeast gas pipeline. We have the ability, and obligation, to prevent this type of damage to our infrastructure from malicious cyber attacks. This Public Input is based upon 240.6(D) and 708.7 in the 2023 NEC. Pay particular attention to the word "identified" in (2) a. "Identified" as applied to equipment, is defined in Article 100 as "Recognizable as suitable for the specific purpose, function, use, environment, application, and so forth, where described in a particular Code requirement. Informational Note: Some examples of ways to determine suitability of equipment for a specific purpose, environment, or application include investigations by a qualified testing laboratory (listing and labeling), an inspection agency, or other organization concerned with product evaluation." This Public Input simply requires that switchboards, switchgear, and panelboards either not be connected to the internet, or if they are connected to the internet, that they be identified for cybersecurity and that an assessment is provided.

Submitter Information Verification

Submitter Full Name: Vincent Saporita

Organization: Saporita Consulting

Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Fri Jun 30 11:12:24 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: The submitter did not provide specific information on the history of switchboard, switchgear and panelboards equipment covered by article 408 and Cybersecurity events. This PI is overly broad in scope, and would affect a very wide variety of equipment with unknown cost and complexity impact. In addition, the type of one-time assessment mandated by this PI, even with a five-year interval, would be woefully inadequate in guaranteeing Cybersecurity for this type of equipment and system. Such a guarantee of Cybersecurity can only result from ongoing persistent expert activity that is outside the scope of article 408 and outside the expertise of an AHJ to evaluate. Note for CC: Consider creating a TG to explore how cybersecurity requirements can be integrated in the NEC.

Public Input No. 1953-NFPA 70-2023 [New Section after 408.9]

408.15 Switchboard and Switchgear Rating.

All switchboards and switchgear shall have a rating not less than the minimum feeder capacity required for the load calculated in accordance with Article 220, Parts III, IV, or V, as applicable. The rating of the equipment considered for this requirement shall be the largest rating noted on the switchboard or switchgear label.

Statement of Problem and Substantiation for Public Input

The NEC has long required panelboards to be rated not less than the calculated loads the panelboard serves (408.30), but there is not a similar requirement for switchboards and switchgear. Jurisdictions (AHJs) can enforce proper sizing of feeder conductors per the calculated loads, but under the current and past editions of the NEC there is not a requirement to prevent someone from installing a switchboard or switchgear which has an overall rating less than the minimum rating of the feeders. Jurisdictions (AHJs) sometimes come across this issue and currently do not have any requirement they can point to in order to prevent under-rated switchboards or switchgear to be installed.

Submitter Information Verification

Submitter Full Name: Rudy Garza
Organization: IAEI
Street Address:
City:
State:
Zip:

Submittal Date: Tue Aug 08 14:06:40 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-8970-NFPA 70-2024

Statement: Section 408.30 was moved to 408.14 and language has been added to ensure switchboards and switchgear are rated not less than the calculated loads. Changes were made to comply with 4.1.4 of the NEC Style Manual. Added “current” in front of “rating” to clarify the meaning.

Due to requirements of Section 408.30 being relocated to Section 408.14, the reference in 408.36 has been updated.

Public Input No. 3588-NFPA 70-2023 [New Section after 408.9]

408.10 Bus ratings

All swtichgear, switchboards, and panelboards shall have a rating not less than the minimum feeder capacity required for the load calculated in accordance with Part III, IV, or V of Article 220 , as applicable.

Statement of Problem and Substantiation for Public Input

This PI is a recommendation to move the current text of 408.30 to 408.10. This moves it from Part III, panelboards, to Part I, General.
This would have the effect of making this a requirement for not just panelboards but also for switchgear and switchboards.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3587-NFPA 70-2023 [Section No. 408.30]	Move 408.30 to 408.10
Public Input No. 3589-NFPA 70-2023 [Section No. 408.36 [Excluding any Sub-Sections]]	

Submitter Information Verification

Submitter Full Name: Eric Stromberg
Organization: Los Alamos National Laboratory
Affiliation: self
Street Address:
City:
State:
Zip:

Submittal Date: Mon Sep 04 21:16:16 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-8970-NFPA 70-2024

Statement: Section 408.30 was moved to 408.14 and language has been added to ensure switchboards and switchgear are rated not less than the calculated loads. Changes were made to comply with 4.1.4 of the NEC Style Manual. Added “current” in front of “rating” to clarify the meaning.

Due to requirements of Section 408.30 being relocated to Section 408.14, the reference in 408.36 has been updated.

Public Input No. 4312-NFPA 70-2023 [New Section after 408.16]

408.14 General.

All switchboards and switchgear shall have a rating not less than the minimum feeder capacity required for the load calculated in accordance with Part III, IV, or V of Article 220, as applicable.

408.15 Overcurrent Protection.

In addition to the requirement of 408.14, a switchboards and switchgear shall be protected by an overcurrent protective device having a rating not greater than that of the switchboards and switchgear. This overcurrent protective device shall be located within or at any point on the supply side of the switchboards and switchgear.

Statement of Problem and Substantiation for Public Input

Copying and pasting the requirements of overcurrent protection for panelboards sections 408.30 and 408.36 to Part II Switchboards and Switchgear. This proposed revision will provide overcurrent protection requirements for switchboards and switchgear.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Thu Sep 07 10:51:47 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: Without all known configurations of switchgear, this could have unintended consequences and restricts common design practices.

Public Input No. 2680-NFPA 70-2023 [Section No. 408.30]

408.30 General.

All panelboards shall have a rating not less than the minimum feeder capacity required for the load calculated in accordance with Article 220, Part III, IV, or V- ~~of Article 220~~ , as applicable.

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. The text is revised to to comply with the NEC Style Manual Section 4.1.4, regarding the use of Parts.
4.1.4 References to an Entire Article. References shall not be made to an entire article, except for the Article 100 or where referenced to provide the necessary context. References to specific parts within articles shall be permitted. References to all parts of an article shall not be permitted. The article number shall precede the part number.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:

Submittal Date: Thu Aug 24 09:33:48 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-8970-NFPA 70-2024

Statement: Section 408.30 was moved to 408.14 and language has been added to ensure switchboards and switchgear are rated not less than the calculated loads. Changes were made to comply with 4.1.4 of the NEC Style Manual. Added “current” in front of “rating” to clarify the meaning.

Due to requirements of Section 408.30 being relocated to Section 408.14, the reference in 408.36 has been updated.

Public Input No. 3587-NFPA 70-2023 [Section No. 408.30]

~~**408.30** General.~~

~~All panelboards shall have a rating not less than the minimum feeder capacity required for the load calculated in accordance with Part III, IV, or V of Article 220, as applicable..~~

Statement of Problem and Substantiation for Public Input

This is a companion PI to move this section to a new section 408.10. Moving it to Part 1 will make it applicable to Switchgear, Switchboards, and Panelboards.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3588-NFPA 70-2023 [New Section after 408.9]	

Submitter Information Verification

Submitter Full Name: Eric Stromberg
Organization: Los Alamos National Laboratory
Affiliation: Self
Street Address:
City:
State:
Zip:
Submittal Date: Mon Sep 04 21:13:41 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-8970-NFPA 70-2024

Statement: Section 408.30 was moved to 408.14 and language has been added to ensure switchboards and switchgear are rated not less than the calculated loads. Changes were made to comply with 4.1.4 of the NEC Style Manual. Added “current” in front of “rating” to clarify the meaning.

Due to requirements of Section 408.30 being relocated to Section 408.14, the reference in 408.36 has been updated.

Public Input No. 3589-NFPA 70-2023 [Section No. 408.36 [Excluding any Sub-Sections]]

In addition to the requirement of 408.~~30~~ 10 , a panelboard shall be protected by an overcurrent protective device having a rating not greater than that of the panelboard. This overcurrent protective device shall be located within or at any point on the supply side of the panelboard.

Exception No. 1: Individual protection shall not be required for a panelboard protected by two main circuit breakers or two sets of fuses in other than service equipment, having a combined rating not greater than that of the panelboard. A panelboard constructed or wired under this exception shall not contain more than 42 overcurrent devices. For the purposes of determining the maximum of 42 overcurrent devices, a 2-pole or a 3-pole circuit breaker shall be considered as two or three overcurrent devices, respectively.

Exception No. 2: For existing panelboards, individual protection shall not be required for a panelboard used as service equipment for an individual residential occupancy.

Statement of Problem and Substantiation for Public Input

This is a companion PI to the PI to move 408.30 to 408.10. If the Code Making Panel chooses not to move .30 to .10, this PI is null and void. If the Code Making Panel moves .30 to .10, then this reference will need to be changed.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3588-NFPA 70-2023 [New Section after 408.9]	moved section from .30 to .10

Submitter Information Verification

Submitter Full Name: Eric Stromberg
Organization: Los Alamos National Laboratory
Affiliation: Self
Street Address:
City:
State:
Zip:
Submittal Date: Mon Sep 04 21:22:21 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-8970-NFPA 70-2024

Statement: Section 408.30 was moved to 408.14 and language has been added to ensure switchboards and switchgear are rated not less than the calculated loads. Changes were made to comply with 4.1.4 of the NEC Style Manual. Added “current” in front of “rating” to clarify the meaning.

Due to requirements of Section 408.30 being relocated to Section 408.14, the reference in 408.36 has been updated.

Public Input No. 698-NFPA 70-2023 [Section No. 408.38]

408.38 Enclosure.

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

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

Statement of Problem and Substantiation for Public Input

Section 110.3(A) already requires ALL equipment to be evaluated. As written, this language does not add anything that is not already required.

Submitter Information Verification

Submitter Full Name:	Ryan Jackson
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Street Address:	
City:	
State:	
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Submittal Date:	Thu Apr 20 15:36:53 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: A technical substantiation has not been provided for the new requirement.

Public Input No. 2073-NFPA 70-2023 [Section No. 408.40]

408.40 Grounding of Panelboards.

Panelboard cabinets and panelboard frames, if of metal, shall be in physical contact with each other and shall be connected to an equipment grounding conductor. Where the enclosed panelboard is used with nonmetallic raceway or cable or where separate equipment grounding conductors are provided, a terminal bar for the equipment grounding conductors shall be secured inside the cabinet. The terminal bar shall be bonded to the ~~cabinet and~~ enclosed panelboard frame, if of metal; otherwise it shall be connected to the equipment grounding conductor that is run with the conductors feeding the panelboard.

Exception: Where an isolated equipment grounding conductor for a branch circuit or a feeder is provided as permitted by 250.146(D), the insulated equipment grounding conductor that is run with the circuit conductors shall be permitted to pass through the panelboard without being connected to the panelboard's equipment grounding terminal bar.

Equipment grounding conductors shall not be connected to a terminal bar provided for grounded conductors or neutral conductors unless the bar is identified for the purpose and is located where interconnection between equipment grounding conductors and grounded circuit conductors is permitted or required by Part II and Part VII of Article 250.

Statement of Problem and Substantiation for Public Input

The term 'panelboard' and 'enclosed panelboard' are defined terms. Adding the word 'enclosed panelboard' makes the text technically correct. Note: The term 'Enclosed Panelboard' was added to NEC Article 100 during the 2023 Code cycle.

Submitter Information Verification

Submitter Full Name:	Mike Holt
Organization:	Mike Holt Enterprises Inc
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Fri Aug 11 15:17:03 EDT 2023
Committee:	NEC-P10

Committee Statement

Resolution: The use of the term panelboard permits for an open-style or enclosed-type panelboard and adding the word 'enclosed' would cause the requirement to not be applicable where open panelboards are installed.

Public Input No. 2681-NFPA 70-2023 [Section No. 408.40]

408.40 Grounding of Panelboards.

Panelboard cabinets and panelboard frames, if of metal, shall be in physical contact with each other and shall be connected to an equipment grounding conductor. Where the panelboard is used with nonmetallic raceway or cable or where separate equipment grounding conductors are provided, a terminal bar for the equipment grounding conductors shall be secured inside the cabinet. The terminal bar shall be bonded to the cabinet and panelboard frame, if of metal; otherwise it shall be connected to the equipment grounding conductor that is run with the conductors feeding the panelboard.

Exception: Where an isolated equipment grounding conductor for a branch circuit or a feeder is provided as permitted by 250.146(D), the insulated equipment grounding conductor that is run with the circuit conductors shall be permitted to pass through the panelboard without being connected to the panelboard's equipment grounding terminal bar.

Equipment grounding conductors shall not be connected to a terminal bar provided for grounded conductors or neutral conductors unless the bar is identified for the purpose and is located where interconnection between equipment grounding conductors and grounded circuit conductors is permitted or required by Article 250, Part II and Part VII ~~of Article 250~~ .

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. The text is revised to to comply with the NEC Style Manual Section 4.1.4, regarding the use of Parts.
4.1.4 References to an Entire Article. References shall not be made to an entire article, except for the Article 100 or where referenced to provide the necessary context. References to specific parts within articles shall be permitted. References to all parts of an article shall not be permitted. The article number shall precede the part number.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 24 09:34:32 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: FR-8985-NFPA 70-2024
Statement: Changes made to comply with section 4.1.4 of the NEC Style Manual.

Public Input No. 2837-NFPA 70-2023 [Section No. 408.40]

408.~~40~~ 40 Equipment Grounding ~~of~~ Connection to Panelboards.

Panelboard cabinets and panelboard frames, if of metal, shall be in physical contact with each other and shall be connected to an equipment grounding conductor. Where the panelboard is used with nonmetallic raceway or cable or where separate equipment grounding conductors are provided, a terminal bar for the equipment grounding conductors shall be secured inside the cabinet. The terminal bar shall be bonded to the cabinet and panelboard frame, if of metal; otherwise it shall be connected to the equipment grounding conductor that is run with the conductors feeding the panelboard.

Exception: Where an isolated equipment grounding conductor for a branch circuit or a feeder is provided as permitted by 250.146(D), the insulated equipment grounding conductor that is run with the circuit conductors shall be permitted to pass through the panelboard without being connected to the panelboard's equipment grounding terminal bar.

Equipment grounding conductors shall not be connected to a terminal bar provided for grounded conductors or neutral conductors unless the bar is identified for the purpose and is located where interconnection between equipment grounding conductors and grounded circuit conductors is permitted or required by Part II and Part VII of Article 250.

Statement of Problem and Substantiation for Public Input

The section title must be revised to match the technical requirement. In accordance with NEC style manual section 2.1.3.2 the title must be descriptive and concise with the intent of the requirement.
See 215.6 Feeder Equipment Grounding Conductor, 320.108 Equipment Grounding Conductor, 330.108 Equipment Grounding Conductor, 334.108 Equipment Grounding Conductor, 410.182 Equipment Grounding Conductor, 547.27 Separate Equipment Grounding Conductor, 555.37 Equipment Grounding Conductor, and 690.45 Size of Equipment Grounding Conductors.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
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Zip:
Submittal Date: Fri Aug 25 14:26:18 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The proposed language does not add clarity to the requirements. The added language is unnecessary.

Public Input No. 2074-NFPA 70-2023 [Section No. 408.41]

408.41 Grounded Conductor Terminations.

Each grounded conductor shall terminate within the enclosed panelboard in an individual terminal that is not also used for another conductor.

Exception: Grounded conductors of circuits with parallel conductors shall be permitted to terminate in a single terminal if the terminal is identified for connection of more than one conductor.

Statement of Problem and Substantiation for Public Input

The term ‘panelboard’ and ‘enclosed panelboard’ are defined terms. Adding the word ‘enclosed panelboard’ makes the text technically correct. Note: The term ‘Enclosed Panelboard’ was added to NEC Article 100 during the 2023 Code cycle.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Fri Aug 11 15:19:00 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: The use of the term panelboard permits for an open-style or enclosed-type panelboard and adding the word ‘enclosed’ would cause the requirement to not be applicable where open panelboards are installed.

Public Input No. 1347-NFPA 70-2023 [Definition:]

Table A.1(a) Product Safety Standards for Conductors and Equipment That Have an Associated Listing Requirement

Article	Standard Number	Standard Title
110	UL 10C	Positive Pressure Fire Tests of Door Assemblies
	UL 305	Panic Hardware
	UL 486D	Sealed Wire Connector Systems
	UL 2043	Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces
	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
210	UL 498	Attachment Plugs and Receptacles
	UL 935	Fluorescent-Lamp Ballasts
	UL 943	Ground Fault Circuit Interrupters
	UL 1029	High-Intensity-Discharge Lamp Ballast
	UL 1699	Arc-Fault Circuit-Interrupters
	UL 1699A	Outlet Branch Circuit AFCIs
225	UL 6	Electrical Rigid Metal Conduit — Steel
	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	UL 360	Liquid-Tight Flexible Metal Conduit
	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	UL 1242	Electrical Intermediate Metal Conduit — Steel
	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
230	UL 6	Electrical Rigid Metal Conduit — Steel

UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
UL 67	Panelboards
UL 98	Enclosed and Dead-Front Switches
UL 218	Fire Pump Controllers
UL 231	Power Outlets
UL 347	Medium-Voltage AC Contactors, Controllers, and Control Centers
UL 360	Liquid-Tight Flexible Metal Conduit
UL 414	Meter Sockets
UL 486A-486B	Wire Connectors
UL 486C	Splicing Wire Connectors
UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
UL 508	Industrial Control Equipment
UL 508A	Industrial Control Panels
UL 514B	Conduit, Tubing and Cable Fittings
UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
UL 845	Motor Control Centers
UL 857	Busways
UL 869A	Reference Standard for Service Equipment

-

UL 891	Switchboards

- - - -

UL 1436	Outlet Circuit Testers and Other Similar Indicating Devices
UL 61010-1	Electrical Equipment for Measurement, Control and Laboratory Use - Part 1: General Requirements
UL 61010-2-030	Electrical Equipment for Measurement, Control, and Laboratory Use - Part 2-030: Particular Requirements for Testing and Measuring Circuits
UL 977	Fused Power-Circuit Devices

-

UL 1008	Transfer Switch Equipment

-

UL 1008A	Transfer Switch Equipment, Over 1000 Volts

-

UL 1008M	Meter-Mounted Transfer Switches

-

UL 1008S	Solid-State Transfer Switches

-

UL 1053	Ground-Fault Sensing and Relaying Equipment

-

UL 1062	Unit Substations

-

UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures

-

UL 1242	Electrical Intermediate Metal Conduit — Steel

-

UL 1429	Pullout Switches

-

UL 1449	Surge Protective Devices

-

UL 1558	Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear

-

UL 1660	Liquid-Tight Flexible Nonmetallic Conduit

-

UL 1740	Robots and Robotic Equipment

-

UL 1953	Power Distribution Blocks

-

	UL 2011	Machinery
	UL 2200	Stationary Engine Generator Assemblies
	UL 2416	Audio/Video, Information and Communication Technology Equipment Cabinet, Enclosure and Rack Systems
	UL 2446	Unitary Boiler Room Systems
	UL 2565	Industrial Metalworking and Woodworking Machine Tools
	UL 2735	Electric Utility Meters
	UL 2745	Meter Socket Adapters for Communications Equipment
	UL 2876	Remote Racking Devices for Switchgear and Controlgear
	UL 4248-1	Fuseholders — Part 1: General Requirements
	UL 60947-1	Low-Voltage Switchgear and Controlgear — Part 1: General Rules
	UL 61800-5-1	Adjustable Speed Electrical Power Drive Systems — Part 5-1: Safety Requirements — Electrical, Thermal and Energy
240	UL 248-1	Low-Voltage Fuses — Part 1: General Requirements
	UL 248-2	Low-Voltage Fuses — Part 2: Class C Fuses
	UL 248-3	Low-Voltage Fuses — Part 2: Class CA and CB Fuses
	UL 248-4	Low-Voltage Fuses — Part 4: Class CC Fuses
	UL 248-5	Low-Voltage Fuses — Part 5: Class G Fuses
	UL 248-6	Low-Voltage Fuses — Part 6: Class H Non-Renewable Fuses
	UL 248-8	Low-Voltage Fuses — Part 8: Class J Fuses

UL 248-9	Low-Voltage Fuses — Part 9: Class K Fuses

-

UL 248-10	Low-Voltage Fuses — Part 10: Class L Fuses

-

UL 248-11	Low-Voltage Fuses — Part 11: Plug Fuses

-

UL 248-12	Low-Voltage Fuses — Part 12: Class R Fuses

-

UL 248-15	Low-Voltage Fuses — Part 15: Class T Fuses

-

UL 248-17	Low-Voltage Fuses — Part 17: Class CF Fuses

-

UL 248-18	Low-Voltage Fuses — Part 18: Class CD Fuses

-

UL 489	Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures

-

UL 489I	Solid State Molded-Case Circuit Breakers

-

UL 943	Ground-Fault Circuit-Interrupters

-

UL 1053	Ground-Fault Sensing and Relaying Equipment

-

UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures

-

	UL 4248-1	Fuseholders — Part 1: General Requirements
242	UL 1449	Surge Protective Devices
250	UL 1	Flexible Metal Conduit

-

UL 4	Armored Cable

-

UL 5	Surface Metal Raceways and Fittings

-

UL 6	Electrical Rigid Metal Conduit — Steel

-

UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel

-

UL 360	Liquid-Tight Flexible Metal Conduit
UL 467	Grounding and Bonding Equipment
UL 486A-486B	Wire Connectors
UL 486C	Splicing Wire Connectors
UL 486D	Sealed Wire Connector Systems
UL 498	Attachment Plugs and Receptacles
UL 504	Mineral-Insulated, Metal-Sheathed Cable
UL 514A	Metallic Outlet Boxes
UL 514B	Conduit, Tubing, and Cable Fittings
UL 797	Electrical Metallic Tubing — Steel
UL 797A	Electrical Metallic Tubing — Aluminum
UL 1242	Electrical Intermediate Metal Conduit — Steel
UL 1569	Metal-Clad Cables

	UL 1652	Flexible Metallic Tubing
300	UL 4	Armored Cable

UL 44	Thermoset-Insulated Wires and Cables
UL 83	Thermoplastic-Insulated Wires and Cables
UL 83A	Fluoropolymer Insulated Wire
UL 263	Fire Tests of Building Construction and Materials

	UL 504	Mineral-Insulated, Metal-Sheathed Cable
	UL 746C	Polymeric Materials — Use in Electrical Equipment Evaluations
	UL 1569	Metal-Clad Cable
	UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords
	UL 2239	Hardware for Support of Conduit, Tubing and Cable
	UL 2556	Wire and Cable Test Methods
	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
310	UL 44	Thermoset-Insulated Wires and Cables
	UL 83	Thermoplastic-Insulated Wires and Cables
	UL 83A	Fluoropolymer Insulated Wire
	UL 224	Extruded Insulating Tubing
	UL 1063	Machine-Tool Wires and Cables
	UL 1441	Coated Electrical Sleeving
315	ANSI C119.4	Electric Connectors — Connectors for Use between Aluminum-to-Aluminum and Aluminum-to-Copper Conductors Designed for Normal Operation at or Below 93ºC and Copper-to-Copper Conductors Designed for Normal Operation at or Below 100ºC
	IEEE 48	IEEE Standard for Test Procedures and Requirements for Alternating-Current Cable Terminations Used on Shielded Cables Having Laminated Insulation Rated 2.5 kV through 765 kV or Extruded Insulation Rated 2.5 kV through 500 kV
	IEEE 386	IEEE Standard for Separable Insulated Connector Systems for Power Distribution Systems Rated 2.5 kV through 35 kV
	IEEE 404	IEEE Standard for Extruded and Laminated Dielectric Shielded Cable Joints Rated 2.5 kV to 500 kV

	UL 4	Armored Cable
	UL 504	Mineral-Insulated, Metal-Sheathed Cable
	UL 1072	Medium Voltage Power Cables
	UL 1569	Metal-Clad Cable
312	UL 50	Enclosures for Electrical Equipment
	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	UL 916	Energy Management Equipment
	UL 2808	Energy Monitoring Equipment
	UL 61010-1 and UL 61010-2-030	Electrical Equipment for Measurement, Control, and Laboratory Use — Part 2-030: Particular Requirements for Testing and Measuring Circuits
314	UL 50	Enclosures for Electrical Equipment
	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	UL 486D	Sealed Wire Connector Systems
	UL 498	Attachment Plugs and Receptacles
	UL 498B	Receptacles with Integral Switching Means
	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection
	UL 514A	Metallic Outlet Boxes
	UL 514B	Conduit, Tubing, and Cable Fittings

	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
-		
	UL 514D	Cover Plates for Flush-Mounted Wiring Devices
-		
	UL 1953	Power Distribution Blocks
320	UL 4	Armored Cable
-		
	UL 44	Thermoset-Insulated Wires and Cables
-		
	UL 83	Thermoplastic-Insulated Wires and Cables
-		
	UL 83A	Fluoropolymer Insulated Wire
-		
	UL 514B	Conduit, Tubing, and Cable Fittings
-		
	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
-		
	UL 1063	Machine-Tool Wires and Cables
-		
	UL 1565	Positioning Devices
-		
	UL 2239	Hardware for the Support of Conduit, Tubing, and Cable
- - -		
322	UL 486A-486B	Wire Connectors
-		
	UL 498	Attachment Plugs and Receptacles
-		
	UL 514A	Metallic Outlet Boxes
- - -		
324	UL 486A-486B	Wire Connectors
-		
	UL 498	Attachment Plugs and Receptacles
330	UL 44	Thermoset-Insulated Wires and Cables
-		
	UL 66	Fixture Wire
-		

UL 83	Thermoplastic-Insulated Wires and Cables

-

UL 83A	Fluoropolymer Insulated Wire

-

UL 514B	Conduit, Tubing, and Cable Fittings

-

UL 1063	Machine-Tool Wires and Cables

-

UL 1565	Positioning Devices

-

UL 1569	Metal-Clad Cables

-

UL 2225	Cables and Cable-Fittings For Use In Hazardous (Classified) Locations

-

	UL 2239	Hardware for the Support of Conduit, Tubing, and Cable
332	UL 504	Mineral-Insulated, Metal-Sheathed Cable

-

	UL 514B	Conduit, Tubing and Cable Fittings
334	UL 719	Nonmetallic-Sheathed Cables

-

UL 2256	Nonmetallic Sheathed Cable Interconnects

-

	UL 62275	Cable Management Systems — Cable Ties for Electrical Installations
335	UL 2250	Instrumentation Tray Cable
336	UL 514B	Conduit, Tubing, and Cable Fittings

-

UL 1277	Electrical Power and Control Tray Cables with Optional Optical-Fiber Members

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	UL 2225	Cables and Cable-Fittings For Use In Hazardous (Classified) Locations
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UL 698A	Industrial Control Panels Relating to Hazardous (Classified) Locations

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UL 783	Electric Flashlights and Lanterns for Use in Hazardous (Classified) Locations

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UL 823	Electric Heaters For Use in Hazardous (Classified) Locations

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UL 844	Electric Heaters For Use in Hazardous (Classified) Locations

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UL 60079-30-1	Explosive Atmospheres — Electrical Resistance Trace Heating — General and Testing Requirements

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UL 122001	General Requirements for Electrical Ignition Systems for Internal Combustion Engines in Class I, Division 2 or Zone 2, Hazardous (Classified) Locations

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IEEE 844.1	Skin Effect Trace Heating of Pipelines, Vessels, Equipment, and Structures — General, Testing, Marking, and Documentation Requirements

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UL 60079-33	Explosive Atmospheres — Part 33: Equipment Protection by Special Protection “s”

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UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts

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	UL 2305	Exhibition Display Units, Fabrication and Installation
	UL 2305A	Convention Center Cord Sets
520	UL 62	Flexible Cords and Cables
	UL 334	Theater Lighting Distribution and Control Equipment

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UL 1573	Stage and Studio Luminaires and Connector Strips	

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UL 1640	Portable Power-Distribution Equipment	

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	UL 1691	Single Pole Locking-Type Separable Connectors
522	UL 13	Power Limited Circuit Cables

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UL 1063	Machine-Tool Wires and Cables

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	UL 2250	Instrumentation Tray Cable
525	UL 62	Flexible Cords and Cables

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UL 817	Cord Sets and Power-Supply Cords

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UL 943	Ground-Fault Circuit-Interrupters

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UL 943C	Special Purpose Ground-Fault Circuit-Interrupters

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	UL 1691	Single Pole Locking-Type Separable Connectors
530	UL 62	Flexible Cords and Cables

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UL 1479	Fire Tests of Penetration Firestops

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UL 1573	Stage and Studio Luminaires and Connector Strips

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UL 1680	Stage and Lighting Cables

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UL 1691	Single Pole Locking-Type Separable Connectors

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UL 1836	Electric Motors and Generators for Use in Class I, Division 2, Class I, Zone 2, Class II, Division 2 and Zone 22 Hazardous (Classified) Locations

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UL 5A	Nonmetallic Surface Raceways and Fittings

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UL 5B	Strut-Type Channel Raceways and Fittings

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UL 5C	Surface Raceways and Fittings for Use with Data, Signal, and Control Circuits

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UL 498	Attachment Plugs and Receptacles

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UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts

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UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection

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UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts

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UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers

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	UL 2024	Cable Routing Assemblies and Communications Raceways
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UL 50E	Enclosures for Electrical Equipment, Environmental Considerations

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UL 62	Flexible Cords and Cables

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UL 514A	Metallic Outlet Boxes

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UL 514B	Conduit, Tubing, and Cable Fittings

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UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers

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UL 1598	Luminaires

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	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
550	UL 6	Electrical Rigid Metal Conduit — Steel

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UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel

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UL 83	Thermoplastic-Insulated Wires and Cables

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UL 307B	Gas-Burning Heating Appliances for Manufactured Homes and Recreational Vehicles

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UL 360	Liquid-Tight Flexible Metal Conduit

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UL 467	Grounding and Bonding Equipment

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UL 498	Attachment Plugs and Receptacles

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UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts

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UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection

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UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts

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UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings

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UL 817	Cord Sets and Power-Supply Cords

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UL 1242	Electrical Intermediate Metal Conduit — Steel

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UL 1462	Mobile Home Pipe Heating Cable

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UL 1598	Luminaires

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UL 2108	Low-Voltage Lighting Systems
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	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
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UL 1377	Wire used in Low Voltage Seasonal Lighting Products In Circuits With a Maximum Available Power of 15W

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600	UL 1	Flexible Metal Conduit

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UL 5	Surface Metal Raceways and Fittings

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UL 5A	Nonmetallic Surface Raceways and Fittings

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UL 13	Power-Limited Circuit Cables

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UL 48	Electric Signs

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UL 50	Enclosures for Electrical Equipment, Non-Environmental Considerations

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UL 50E	Enclosures for Electrical Equipment, Environmental Considerations

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UL 98B	Enclosed and Dead-Front Switches for Use in Photovoltaic Systems

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UL 248-19	Low-Voltage Fuses — Part 19: Photovoltaic Fuses

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UL 360	Liquid-Tight Flexible Metal Conduit

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UL 489B	Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures For Use With Photovoltaic (PV) Systems

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UL 508I	Disconnect Switches Intended for Use in Photovoltaic Systems

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UL 814	Gas-Tube-Sign Cable

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UL 879	Electric Sign Components

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UL 879A	LED Sign and Sign Retrofit Kits

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UL 879B	Polymeric Enclosure Systems for the Splice Between Neon Tubing Electrode Leads and GTO Cable, and the GTO Cable Leading to the Splice

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UL 943	Ground-Fault Circuit-Interrupters

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UL 1310	Class 2 Power Units

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UL 1660	Liquid-Tight Flexible Nonmetallic Conduit

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UL 1699B	Photovoltaic (PV) DC Arc-Fault Circuit Protection

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Ul 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources

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UL 2161	Neon Transformers and Power Supplies

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UL 2703	Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels

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UL 3001	Distributed Energy Generation and Storage Systems

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UL 3003	Distributed Generation Cables

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UL 3703	Solar Trackers

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UL 4703	Photovoltaic Wire

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UL 6703	Connectors for Use in Photovoltaic Systems

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UL 7103	Investigation for Building-Integrated Photovoltaic Roof Coverings

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UL 8703	Concentrator Photovoltaic Modules and Assemblies

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UL 9703	Distributed Generation Wiring Harnesses

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UL 61730-1	Photovoltaic (PV) Module Safety Qualification — Part 1: Requirements For Construction

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UL 62109	Power Converters for Use in Photovoltaic Power Systems — Part 1: General Requirements

	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
604	UL 1	Flexible Metal Conduit

UL 4	Armored Cable

UL 5	Surface Metal Raceways and Fittings

UL 5A	Nonmetallic Surface Raceways and Fittings

UL 5B	Strut-Type Channel Raceways and Fittings

UL 5C	Surface Raceways and Fittings for Use with Data, Signal, and Control Circuits

UL 62	Flexible Cords and Cables

UL 183	Manufactured Wiring Systems

UL 209	Cellular Metal Floor Raceways and Fittings

UL 360	Liquid-Tight Flexible Metal Conduit

UL 797	Electrical Metallic Tubing — Steel

UL 797A	Electrical Metallic Tubing — Aluminum and Stainless Steel

UL 857	Busways

UL 1569	Metal-Clad Cables

	UL 2024	Cable Routing Assemblies and Communications Raceways
605	UL 962	Household and Commercial Furnishings

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UL 1286	Office Furnishings Systems

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UL 1310	Class 2 Power Units

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UL 2999	Individual Commercial Office Furnishings

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UL 5085-3	Low Voltage Transformers — Part 3: Class 2 and Class 3 Transformers

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	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
610	UL 62	Flexible Cords and Cables

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	UL 2273	Festoon Cable
620	UL 62	Flexible Cords and Cables

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UL 83	Thermoplastic-Insulated Wires and Cables

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UL 98	Enclosed and Dead-Front Switches

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UL 104	Elevator Door Locking Devices and Contacts

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UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures

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UL 508	Industrial Control Equipment

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UL 508A	Industrial Control Panels

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UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures

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UL 1310	Class 2 Power Units

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UL 1449	Surge Protective Devices

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UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables

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	UL 2556	Wire and Cable Test Methods

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	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
625	UL 62	Flexible Cords And Cables

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UL 1650	Portable Power Cable

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UL 2202	Electric Vehicle (EV) Charging System Equipment

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UL 2231-1	Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits — Part 1: General Requirements

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UL 2231-2	Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits — Part 2: Particular Requirements for Protection Devices for Use in Charging Systems

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UL 2251	Plugs, Receptacles and Couplers for Electrical Vehicles

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UL 2580	Batteries for Use in Electric Vehicles

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UL 2594	Electric Vehicle Supply Equipment

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	UL 9741	Electric Vehicle Power Export Equipment (EVPE)
626	UL 62	Flexible Cords and Cables

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UL 231	Power Outlets

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UL 498	Attachment Plugs and Receptacles

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UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts

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UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection

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UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts

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UL 817	Cord Sets and Power-Supply Cords

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	UL 1651	Optical Fiber Cable

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	UL 1686	Pin and Sleeve Configurations
630	UL 551	Transformer-Type Arc-Welding Machines
640	UL 13	Power Limited Circuit Cables

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UL 62	Flexible Cords and Cables

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UL 813	Commercial Audio Equipment

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UL 1310	Class 2 Power Units

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UL 1419	Professional Video and Audio Equipment

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UL 1492	Audio-Video Products and Accessories

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UL 1711	Amplifiers for Fire Protective Signaling Systems

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UL 2269	Optical Fiber/Communications/Signaling/Coaxial Cable Outlet Boxes

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UL 6500	Audio/Video and Musical Instrument Apparatus for Household, Commercial, and Similar General Use

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UL 60065	Audio, Video and Similar Electronic Apparatus — Safety Requirements

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	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
645	UL 38	Manual Signaling Boxes for Fire Alarm Systems

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UL 268	Smoke Detectors for Fire Alarm Systems

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UL 444	Communications Cables

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UL 464	Audible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories

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UL 497B	Protectors for Data Communications and Fire Alarm Circuits

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UL 833	Control Units and Accessories for Fire Alarm Systems

UL 864	Control Units and Accessories for Fire Alarm Systems
UL 1424	Cables for Power-Limited Fire-Alarm Circuits
UL 1425	Cables for Non-Power-Limited Fire-Alarm Circuits
UL 1449	Surge Protective Devices
UL 1480	Speakers for Fire Alarm and Signaling Systems, Including Accessories
UL 1638	Visible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories
UL 1651	Optical Fiber Cable
UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
UL 1690	Data-Processing Cable
UL 1778	Uninterruptible Power Systems
UL 2024	Cable Routing Assemblies and Communications Raceways
UL 60950-1	Information Technology Equipment Safety — Part 1: General Requirements
UL 60950-21	Information Technology Equipment Safety — Part 21: Remote Power Feeding
UL 60950-22	Information Technology Equipment Safety — Part 22: Equipment to be Installed Outdoors
UL 60950-23	Information Technology Equipment Safety — Part 23: Large Data Storage Equipment

	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
646	UL 10C	Positive Pressure Fire Tests of Door Assemblies

UL 62	Flexible Cords and Cables

UL 67	Panelboards

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UL 98	Enclosed and Dead-Front Switches

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UL 305	Panic Hardware

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UL 347	Medium-Voltage AC Contactors, Controllers, and Control Centers

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UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures

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UL 508	Industrial Control Equipment

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UL 508A	Industrial Control Panels

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UL 845	Motor Control Centers

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UL 869A	Reference Standard for Service Equipment

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UL 891	Switchboards

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UL 924	Emergency Lighting and Power Equipment

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UL 977	Fused Power-Circuit Devices

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UL 1008	Transfer Switch Equipment

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UL 1008A	Transfer Switch Equipment, Over 1000 Volts

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UL 1008M	Meter-Mounted Transfer Switches

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UL 1008S	Solid-State Transfer Switches

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UL 1062	Unit Substations

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UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures

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UL 1429	Pullout Switches

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UL 1449	Surge Protective Devices

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UL 1655	Community-Antenna Television Cables

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UL 1989	Standby Batteries

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UL 2755	Modular Data Centers

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	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
647	UL 1598	Luminaires
650	UL 1310	Class 2 Power Units

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UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords

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	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
670	ANSI/CSA-C22.2 No. 19085-1	Woodworking machines — Safety — Part 1: Common requirements

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UL 508	Industrial Control Equipment

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UL 61800-5-1	Adjustable Speed Electrical Power Drive Systems — Part 5-1: Safety Requirements — Electrical, Thermal and Energy

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675	UL 493	Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables

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	UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords
680	UL 6	Electrical Rigid Metal Conduit — Steel

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UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel

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UL 20	General Use Snap-Switches

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UL 62	Flexible Cords and Cables

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UL 360	Liquid-Tight Flexible Metal Conduit

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UL 379	Power Units for Fountain, Swimming Pool, and Spa Luminaires

-

UL 467	Grounding and Bonding Equipment

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UL 486D	Sealed Wire Connector Systems

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UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures

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UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings

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UL 676	Underwater Luminaires and Submersible Junction Boxes

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UL 676A	Potting Compounds for Swimming Pool, Fountain, and Spa Equipment

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UL 943	Ground-Fault Circuit-Interrupters

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UL 943C	Special Purpose Ground-Fault Circuit-Interrupters

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UL 1004-10	Pool Pump Motors

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UL 1081	Swimming Pool Pumps, Filters, and Chlorinators

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UL 1241	Junction Boxes for Swimming Pool Luminaires

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UL 1242	Electrical Intermediate Metal Conduit — Steel

-

UL 1261	Electric Water Heaters for Pools and Tubs

-

UL 1563	Electric Spas, Equipment Assemblies, and Associated Equipment

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UL 1569	Metal-Clad Cables

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UL 1660	Liquid-Tight Flexible Nonmetallic Conduit

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UL 1795	Hydromassage Bathtubs

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	UL 2420	Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings

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	UL 2452	Electric Swimming Pool and Spa Cover Operators

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	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings

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	UL 2515A	Supplemental Requirements for Extra Heavy Wall Reinforced Thermosetting Resin Conduit (RTRC) and Fittings

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	UL 2995	Lifts for Swimming Pools and Spas

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	UL 60335-2-1000	Household and Similar Electrical Appliances: Particular Requirements for Electrically Powered Pool Lifts
682	UL 486D	Sealed Wire Connector Systems

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	UL 1650	Portable Power Cable

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	UL 1838	Low Voltage Landscape Lighting Systems
690	UL 98B	Enclosed and Dead-Front Switches for Use in Photovoltaic Systems

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	UL 248-19	Low-Voltage Fuses — Part 19: Photovoltaic Fuses

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	UL 467	Grounding and Bonding Equipment

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	UL 489B	Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures For Use With Photovoltaic (PV) Systems

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	UL 508I	Disconnect Switches Intended for Use in Photovoltaic Systems

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	UL 1569	Metal-Clad Cables

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	UL 1699B	Photovoltaic (PV) DC Arc-Fault Circuit Protection

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	UL 1703	Flat-Plate Photovoltaic Modules and Panels

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	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources

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UL 2703	Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels

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UL 3001	Distributed Energy Generation and Storage Systems

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UL 3003	Distributed Generation Cables

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UL 3005	Distributed Energy Resource Management Systems

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UL 3703	Solar Trackers

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UL 3730	Photovoltaic Junction Boxes

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UL 3741	Photovoltaic Hazard Control

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UL 4703	Photovoltaic Wire

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UL 6703	Connectors for Use in Photovoltaic Systems

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UL 7103	Investigation for Building-Integrated Photovoltaic Roof Coverings

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UL 8703	Concentrator Photovoltaic Modules and Assemblies

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UL 8801	Photovoltaic Luminaire Systems

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UL 9703	Distributed Generation Wiring Harnesses

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UL 61730-1	Photovoltaic (PV) Module Safety Qualification — Part 1: Requirements for Construction

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UL 61730-2	Photovoltaic (PV) Module Safety Qualification — Part 2: Requirements for Testing

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UL 62109-1	Power Converters for Use in Photovoltaic Power Systems — Part 1: General Requirements

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UL 62275	Cable Management Systems — Cable Ties for Electrical Installation

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692	UL 2262	Fuel Cell Modules for Use in Portable and Stationary Equipment

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	UL 2262A	Borohydride Fuel Cartridges with Integral Fuel Processing for Use with Portable Fuel Cell Power Systems or Similar Equipment	

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	UL 2265	Fuel Cell Power Units and Fuel Storage Containers for Portable Devices

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	UL 2265A	Hand-held or Hand-Transportable Fuel Cell Power Units with Disposable Methanol Fuel Cartridges for use in Original Equipment Manufacturer's Information Technology Equipment

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	UL 2265C	Hand-Held or Hand-Transportable Alkaline (Direct Borohydride) Fuel Cell Power Units and Borohydride Fuel Cartridges For Use With Consumer Electronics or Information Technology Equipment

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	UL 2266	Electromagnetic Compatibility, Electrical Safety, and Physical Protection of Stationary and Portable Fuel Cell Power Systems for Use with Commercial Network Telecommunications Equipment

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	UL 2267	Fuel Cell Power Systems for Installation in Industrial Electric Trucks

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694	UL 467	Grounding and Bonding Equipment

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	UL 489C	Molded-Case Circuit Breakers and Molded-Case Switches for Use with Wind Turbines

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	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources

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	UL 2227	Flexible Motor Supply Cable and Wind Turbine Tray Cable

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	UL 2736	Single Pole Separable Interconnecting Cable Connectors for Use with Wind Turbine Generating Systems

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	UL 4143	Wind Turbine Generator — Life Time Extension (LTE)

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	UL 6141	Wind Turbines Permitting Entry of Personnel

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	UL 6142	Wind Turbine Generating Systems — Small

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695	UL 6	Electrical Rigid Metal Conduit — Steel

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	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	UL 218	Fire Pump Controllers
	UL 448	Centrifugal Stationary Pumps for Fire-Protection Service
	UL 448B	Residential Fire Pumps Intended for One- and Two-Family Dwellings and Manufactured Homes
	UL 448C	Stationary, Rotary-Type, Positive-Displacement Pumps for Fire Protection Service
	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	UL 1004-5	Fire Pump Motors
	UL 1242	Electrical Intermediate Metal Conduit — Steel
	UL 1569	Metal-Clad Cables
	UL 1724	Fire Tests for Electrical Circuit Protective Systems
	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
700	UL 924	Emergency Lighting and Power Equipment
	UL 1008	Transfer Switch Equipment
	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
	UL 1449	Surge Protective Devices
	UL 1724	Fire Tests for Electrical Circuit Protective Systems
	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables

	UL 2200	Stationary Engine Generator Assemblies
701	UL 924	Emergency Lighting and Power Equipment

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UL 1008	Transfer Switch Equipment

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	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
702	UL 98	Enclosed and Dead-Front Switches

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UL 1008	Transfer Switch Equipment

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UL 1008A	Transfer Switch Equipment, Over 1000 Volts

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UL 1008M	Meter-Mounted Transfer Switches

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	UL 1008S	Solid-State Transfer Switches
705	UL 62	Flexible Cords and Cables

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UL 98	Enclosed and Dead-Front Switches

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UL 486D	Sealed Wire Connector Systems

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UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures

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UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures

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UL 1429	Pullout Switches

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UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources

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UL 2200	Stationary Engine Generator Assemblies

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UL 3003	Distributed Generation Cables

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UL 6141	Wind Turbines Permitting Entry of Personnel

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UL 6142	Small Wind Turbine Systems

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	UL 9540	Energy Storage Systems and Equipment

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	UL 62109-2	Power Converters for Use in Photovoltaic Power Systems — Part 2: Particular Requirements for Inverters
706	UL 248-2	Low-Voltage Fuses — Part 2: Class C Fuses

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UL 248-3	Low-Voltage Fuses — Part 3: Class CA and CB Fuses

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UL 248-4	Low-Voltage Fuses — Part 4: Class CC Fuses

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UL 248-5	Low-Voltage Fuses — Part 5: Class G Fuses

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UL 248-6	Low-Voltage Fuses — Part 6: Class H Non-Renewable Fuses

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UL 248-8	Low-Voltage Fuses — Part 8: Class J Fuses

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UL 248-9	Low-Voltage Fuses — Part 9: Class K Fuses

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UL 248-10	Low-Voltage Fuses — Part 10: Class L Fuses

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UL 248-12	Low-Voltage Fuses — Part 12: Class R Fuses

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UL 248-15	Low-Voltage Fuses — Part 15: Class T Fuses

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UL 248-17	Low-Voltage Fuses — Part 17: Class CF Fuses

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UL 248-18	Low-Voltage Fuses — Part 18: Class CD Fuses

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UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures

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UL 489H	Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures, for Use with Direct Current (DC) Microgrids

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UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures

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UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources

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	UL 9540	Energy Storage Systems and Equipment
708	UL 1	Flexible Metal Conduit

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UL 4	Armored Cable

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UL 83	Thermoplastic-Insulated Wires and Cables

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UL 360	Liquid-Tight Flexible Metal Conduit

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UL 493	Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables

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UL 497A	Secondary Protectors for Communications Circuits

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UL 1008	Transfer Switch Equipment

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UL 1008A	Transfer Switch Equipment, Over 1000 Volts

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UL 1008M	Meter-Mounted Transfer Switches

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UL 1008S	Solid-State Transfer Switches

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UL 1569	Metal-Clad Cables

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	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
710	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources

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UL 2200	Stationary Engine Generator Assemblies

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UL 8801	Photovoltaic Luminaire Systems

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UL 9540	Energy Storage Systems and Equipment

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UL 62109-1	Power Converters for use in Photovoltaic Power Systems — Part 1: General Requirements

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	UL 62109-2	Power Converters for Use in Photovoltaic Power Systems — Part 2: Particular Requirements for Inverters
722	UL 13	Standard for Power-Limited Circuit Cables
	UL 444	Standard for Safety for Communications Cables
	UL 1424	Cables for Power-Limited Fire-Alarm Circuits
	UL 1651	Optical Fiber Cable
	UL 1666	Test for Flame Propagation Height of Electrical and Optical-Fiber Cable Installed Vertically in Shafts
	UL 1685	Standard for Safety for Vertical-Tray Fire-Propagation and Smoke- Release Test for Electrical and Optical-Fiber Cables
	UL 1724	Fire Tests for Electrical Circuit Protective Systems
	UL 2024	Standard for Safety for Communications Cables
	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
	UL 2556	Standard for Wire and Cable Test Methods
725	UL 1310	Class 2 Power Units
	UL 5085-3	Low Voltage Transformers — Part 3: Class 2 and Class 3 Transformers
	UL 9990	Information and Communication Technology (ICT) Power Cables
	UL 61010-2-201	Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use — Part 2-201: Particular Requirements for Control Equipment

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UL 61800-5-1	Adjustable Speed Electrical Power Drive Systems — Part 5-1: Safety Requirements — Electrical, Thermal and Energy

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	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
726	UL 1400-1	Fault-Managed Power Systems — Part 1 General Requirements

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UL 1400-2	Fault-Managed Power Systems — Part 2 Requirements for Cables

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UL 1666	Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts

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UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables

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UL 2556	Wire and Cable Test Methods

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728	UL 5	Surface Metal Raceways and Fittings

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UL 5A	Nonmetallic Surface Raceways and Fittings

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UL 5B	Strut-Type Channel Raceways and Fittings

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UL 5C	Surface Raceways and Fittings for Use with Data, Signal, and Control Circuits

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UL 209	Cellular Metal Floor Raceways and Fittings

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UL 467	Grounding and Bonding Equipment

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UL 514A	Metallic Outlet Boxes

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UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers

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UL 568	Nonmetallic Cable Tray Systems

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UL 884	Underfloor Raceways and Fittings

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UL 1724	Fire Tests for Electrical Circuit Protective Systems

	UL 2024	Cable Routing Assemblies and Communications Raceways
	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
760	UL 268	Smoke Detectors for Fire Alarm Signaling Systems
	UL 268A	Smoke Detectors for Duct Application
	UL 486C	Splicing Wire Connectors
	UL 497B	Protectors for Data Communication and Fire Alarm Circuits
	UL 1424	Cables for Power-Limited Fire-Alarm Circuits
	UL 1425	Cables for Non–Power-Limited Fire-Alarm Circuits
	UL 1480	Speakers for Fire Alarm and Signaling Systems, Including Accessories
	UL 1666	Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts
	UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
	UL 60730-2-14	Automatic Electrical Controls; Part 2: Particular Requirements for Electric Actuators
770	UL 467	Grounding and Bonding Equipment
	UL 568	Nonmetallic Cable Tray Systems
	UL 1651	Optical Fiber Cable
	UL 2024	Optical Fiber and Communication Cable Raceway
	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables

	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
800	UL 444	Communications Cables

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UL 467	Grounding and Bonding Equipment

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UL 489A	Circuit Breakers for Use in Communication Equipment

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UL 497	Protectors for Paired-Conductor Communications Circuits

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UL 497A	Secondary Protectors for Communications Circuits

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UL 497C	Protectors for Coaxial Communications Circuits

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UL 497E	Protectors for Antenna Lead-In Conductors

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UL 523	Telephone Service Drop Wire

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UL 568	Nonmetallic Cable Tray Systems

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UL 723	Test for Surface Burning Characteristics of Building Materials

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UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords

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UL 1666	Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts

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UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables

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UL 1863	Communication Circuit Accessories

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UL 2024	Cable Routing Assemblies and Communications Raceways

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	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
805	UL 444	Communications Cables

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UL 497	Protectors for Paired-Conductor Communications Circuits

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	UL 497A	Secondary Protectors for Communications Circuits
	UL 497C	Protectors for Coaxial Communications Circuits
	UL 497E	Protectors for Antenna Lead-In Conductors
	UL 523	Telephone Service Drop Wire
	UL 719	Nonmetallic-Sheathed Cables
	UL 1310	Class 2 Power Units
	UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords
	UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
	UL 1863	Communication Circuit Accessories
	UL 2043	Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces
	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
810	UL 150	Antenna Rotators
	UL 452	Antenna-Discharge Units
	UL 467	Grounding and Bonding Equipment
	UL 497E	Protectors for Antenna Lead-In Conductors
820	UL 444	Communications Cables
	UL 497E	Protectors for Antenna Lead-In Conductors
	UL 1655	Community-Antenna Television Cables
830	UL 444	Communications Cables

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UL 497A	Secondary Protectors for Communications Circuits

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UL 497C	Protectors for Coaxial Communications Circuits

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UL 497E	Protectors for Antenna Lead-In Conductors

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	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
840	UL 444	Communications Cables

-

UL 467	Grounding and Bonding Equipment

-

UL 498A	Current Taps and Adapters

-

UL 1310	Class 2 Power Units

-

UL 1651	Optical Fiber Cable

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UL 1863	Communication Circuit Accessories

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UL 2024	Cable Routing Assemblies and Communications Raceways

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	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
Tables 11(A) and 11(B)	UL 1310	Class 2 Power Units
	UL 1434	Thermistor-Type Devices
	UL 5085-3	Low Voltage Transformers — Part 3: Class 2 and Class 3 Transformers
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
Tables 12(A) and 12(B)	UL 1310	Class 2 Power Units
	UL 1434	Thermistor-Type Devices
	UL 5085-3	Low Voltage Transformers — Part 3: Class 2 and Class 3 Transformers
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements

Table A.1(b) Product Safety Standards for Conductors and Equipment That Do Not Have an Associated Listing Requirement

Article	**Standard Number**	**Standard Title**
110	UL 969	Marking and Labeling Systems

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	UL 9691	Recommended Practice for Nameplates for Use in Electrical Installations
300	UL 635	Insulating Bushings
314	UL 514C	Conduit, Tubing, and Cable Fittings

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	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
320	UL 514A	Metallic Outlet Boxes

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	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
322	UL 5	Surface Metal Raceways and Fittings

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	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
324	UL 5	Surface Metal Raceways and Fittings

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	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
330	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
332	UL 1565	Positioning Devices

-

	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
334	UL 6	Electrical Rigid Metal Conduit — Steel

-

UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel

-

UL 514B	Conduit, Tubing, and Cable Fittings

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UL 651	Schedule 40 and 80 Rigid PVC Conduit

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UL 797	Electrical Metallic Tubing — Steel

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UL 797A	Electrical Metallic Tubing — Aluminum and Stainless Steel

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UL 1242	Electrical Intermediate Metal Conduit — Steel

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UL 1565	Positioning Devices

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UL 2239	Hardware for the Support of Conduit, Tubing and Cable

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UL 2420	Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings

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	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings

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	UL 2515A	Supplemental Requirements for Extra Heavy Wall Reinforced Thermosetting Resin Conduit (RTRC) and Fittings.
335	UL 2250	Instrumentation Tray Cable
337	UL 1565	Positioning Devices

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	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
340	UL 493	Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables
342	UL 635	Insulating Bushings

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	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
344	UL 635	Insulating Bushings

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	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
348	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
350	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
352	UL 635	Insulating Bushings

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	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
353	UL 635	Insulating Bushings
355	UL 635	Insulating Bushings

-

	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
356	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
358	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
362	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
368	UL 857	Busways
392	UL 568	Nonmetallic Cable Tray Systems
400	UL 62	Flexible Cords and Cables

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UL 498	Attachment Plugs and Receptacles

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UL 498B	Receptacles with Integral Switching Means

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UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts

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UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection

-

UL 514B	Conduit, Tubing, and Cable Fittings

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UL 817	Cord Sets and Power-Supply Cords

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UL 1650	Portable Power Cable

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	UL 1680	Stage and Lighting Cables
402	UL 66	Fixture Wire
408	UL 50	Enclosures for Electrical Equipment, Non-Environmental Considerations

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	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
424	UL 834	Heating, Water Supply, and Power Boilers — Electric

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UL 1693	Electric Radiant Heating Panels and Heating Panel Sets

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UL 1995	Heating and Cooling Equipment

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UL 1996	Electric Duct Heaters

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UL 60335-1	Safety of Household and Similar Electrical Appliances, Part 1: General Requirements

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	UL 60335-2-40	Household and Similar Electrical Appliances, Part 2–40
425	UL 834	Heating, Water Supply, and Power Boilers — Electric
426	UL 1588	Roof and Gutter De-Icing Cable Units
427	UL 515	Electrical Resistance Trace Heating for Commercial Applications

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UL 1462	Mobile Home Pipe Heating Cable

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	UL 2049	Residential Pipe Heating Cable
430	UL 248-13	Low Voltage Fuses — Part 13: Semiconductor Fuses
445	UL 3001	Distributed Energy Generation and Storage Systems

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	UL 3010	Single Site Energy Systems
450	UL 50	Enclosures for Electrical Equipment, Non-Environmental Considerations

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UL 50E	Enclosures for Electrical Equipment, Environmental Considerations

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UL 248-1	Low-Voltage Fuses — Part 1: General Requirements

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UL 248-2	Low-Voltage Fuses — Part 2: Class C Fuses

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UL 248-3	Low-Voltage Fuses — Part 3: Class CA and CB Fuses

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UL 248-4	Low-Voltage Fuses — Part 4: Class CC Fuses

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UL 248-5	Low-Voltage Fuses — Part 5: Class G Fuses

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UL 248-8	Low-Voltage Fuses — Part 8: Class J Fuses

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UL 248-9	Low-Voltage Fuses — Part 9: Class K Fuses

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UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures

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UL 1561	Dry-Type General Purpose and Power Transformers

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	UL 5085-2	Low Voltage Transformers — Part 2: General Purpose Transformers
460	UL 810	Capacitors

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UL 1283	Electromagnetic Interference Filters

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	UL 60384-14	Fixed Capacitors for Use in Electronic Equipment — Part 14: Sectional Specification: Fixed Capacitors for Electromagnetic Interference Suppression and Connection to the Supply Mains
470	UL 508	Industrial Control Equipment

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	UL 1283	Electromagnetic Interference Filters
500	ANSI/IEEE C2	National Electrical Safety Code, Section 127A, Coal Handling Areas

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API RP 14F	Recommended Practice for Design and Installation of Electrical Systems for Fixed and Floating Offshore Petroleum Facilities for Unclassified and Class I, Division 1 and Division 2 Locations

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API RP 500	Recommended Practice for Classification of Locations of Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 and Division 2

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API RP 2003	Protection Against Ignitions Arising Out of Static Lightning and Stray Currents.

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ASHRAE 15	Safety Standard for Refrigeration Systems.

-

ASME B1.20.1	Pipe Threads, General Purpose (Inch)

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IEEE 844.2	Standard for Skin Effect Trace Heating of Pipelines, Vessels, Equipment, and Structures — Application Guide for Design, Installation, Testing, Commissioning, and Maintenance

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IEEE 60079-30-2	IEEE/IEC International Standard for Explosive atmospheres — Part 30-2: Electrical resistance trace heating — Application guide for design, installation, and maintenance

-

IIAR 2	Standard for Safe Design of Closed-Circuit Ammonia Refrigeration Systems

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ISA-12.10	Area Classification in Hazardous (Classified) Dust Locations

-

ISO 965-1	ISO general purpose metric screw threads — Tolerances — Part 1: Principles and basic data

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ISO 965-3	ISO general purpose metric screw threads — Tolerances — Part 3: Deviations for constructional screw threads

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NFPA 30	Flammable and Combustible Liquids Code

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NFPA 32	Standard for Drycleaning Facilities

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NFPA 33	Standard for Spray Application Using Flammable or Combustible Materials

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NFPA 34	Standard for Dipping, Coating and Printing Processes Using Flammable or Combustible Liquids

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NFPA 35	Standard for the Manufacture of Organic Coatings

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NFPA 36	Standard for Solvent Extraction Plants

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NFPA 45	Standard on Fire Protection for Laboratories Using Chemicals

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NFPA 55	Compressed Gases and Cryogenic Fluids Code

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NFPA 58	Liquefied Petroleum Gas Code

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NFPA 59	Utility LP-Gas Plant Code

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NFPA 77	Recommended Practice on Static Electricity

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NFPA 497	Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas

NFPA 499	Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installation in Chemical Process Areas

NFPA 780	Standard for the Installation of Lightning Protection Systems

NFPA 820	Standard for Fire Protection in Wastewater Treatment and Collection Facilities

UL 60079-29-2	Explosive Atmospheres — Part 29-2: Gas detectors — Selection, installation, use and maintenance of detectors for flammable gases and oxygen

UL 120002	Certificate Standard for AEx Equipment for Hazardous (Classified) Locations

UL 120101	Definitions and Information Pertaining to Electrical Equipment in Hazardous (Classified) Locations

UL 121303	Guide for Combustible Gas Detection as a Method of Protection

	UL RP 121203	Recommended Practice for Portable/Personal Electronic Products Suitable for Use in Class I, Division 2, Class I, Zone 2, Class II, Division 2, Class III, Division 1, Class III, Division 2, Zone 21 and 22 Hazardous (Classified) Locations
501	UL 62	Flexible Cord and Cable

	UL 504	Mineral-Insulated, Metal-Sheathed Cable
502	UL RP 121203	Recommended Practice for Portable/Personal Electronic Products Suitable for Use in Class I, Division 2, Class I, Zone 2, Class II, Division 2, Class III, Division 1, Class III, Division 2, Zone 21 and Zone 22 Hazardous (Classified) Locations
503	NFPA 505	Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operations

	UL RP 121203	Recommended Practice for Portable/Personal Electronic Products Suitable for Use in Class I, Division 2, Class I, Zone 2, Class II, Division 2, Class III, Division 1, Class III, Division 2, Zone 21 and Zone 22 Hazardous (Classified) Locations
504	ISA-RP 12.06.01	Recommended Practice for Wiring Methods for Hazardous (Classified) Locations Instrumentation — Part 1: Intrinsic Safety
505	ANSI/API RP 14FZ	Recommended Practice for Design and Installation of Electrical Systems for Fixed and Floating Offshore Petroleum Facilities for Unclassified and Class I, Zone 0, Zone 1, and Zone 2 Locations

API RP 505	Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1, and Zone 2

API RP 2003	Protection Against Ignitions Arising Out of Static Lightning and Stray Currents.

ASME B1.20.1	Pipe Threads, General Purpose (Inch)

EI 15	Model Code of Safe Practice, Part 15: Area Classification Code for Installations Handling Flammable Fluids

IEEE 844.2	Skin Effect Trace Heating of Pipelines, Vessels, Equipment, and Structures — Application Guide for Design, Installation, Testing, Commissioning, and Maintenance

IEEE 60079-30-2	Explosive Atmospheres — Part 30-2: Electrical resistance trace heating — Application guide for design, installation and maintenance

IIAR 2	Standard for Safe Design of Closed-Circuit Ammonia Refrigeration Systems

ISA-60079-10-1 (12.24.01)	Explosive Atmospheres — Part 10-1: Classification of Areas — Explosive gas atmospheres

ISA-60079-29-2	Explosive Atmospheres — Part 29-2: Gas detectors — Selection, installation, use and maintenance of detectors for flammable gases and oxygen

ISO 965-1	ISO general purpose metric screw threads — Tolerances — Part 1: Principles and basic data

ISO 965-3	ISO general purpose metric screw threads — Tolerances — Part 3: Deviations for constructional screw threads

NFPA 30	Flammable and Combustible Liquids Code

NFPA 77	Recommended Practice on Static Electricity

NFPA 497	Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas

NFPA 780	Standard for the Installation of Lightning Protection Systems

UL 80079-20-1	Explosive Atmospheres — Part 20-1: Material Characteristics for Gas and Vapour Classification — Test Methods and Data

UL 120101	Definitions and Information Pertaining to Electrical Equipment in Hazardous (Classified) Locations

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UL 121303	Guide for Use of Detectors for Flammable Gases

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	UL RP 121203	Recommended Practice for Portable/Personal Electronic Products Suitable for Use in Class I, Division 2, Class I, Zone 2, Class II, Division 2, Class III, Division 1, Class III, Division 2, Zone 21 and Zone 22 Hazardous (Classified) Locations
506	ASME B1.20.1	Pipe Threads, General Purpose (Inch)

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IEEE 844.2	Skin Effect Trace Heating of Pipelines, Vessels, Equipment, and Structures — Application Guide for Design, Installation, Testing, Commissioning, and Maintenance

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IEEE 60079-30-2	Explosive Atmospheres — Part 30-2: Electrical resistance trace heating — Application guide for design, installation and maintenance

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ISA-60079-10-2 (12.10.05)	Explosive Atmospheres — Part 10-2: Classification of Areas — Combustible Dust Atmospheres

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NFPA 499	Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installation in Chemical Process Areas

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	UL RP 121203	Recommended Practice for Portable/Personal Electronic Products Suitable for Use in Class I, Division 2, Class I, Zone 2, Class II, Division 2, Class III, Division 1, Class III, Division 2, Zone 21 and Zone 22 Hazardous (Classified) Locations
511	NFPA 30A	Code for Motor Fuel Dispensing Facilities and Repair Garages

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	NFPA 88A	Standard for Parking Structures
512	ICC IFC	International Fire Code

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NFPA 1	Fire Code

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NFPA 30	Flammable and Combustible Liquids Code

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NFPA 33	Standard for Spray Application Using Flammable or Combustible Materials

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NFPA 36	Standard for Solvent Extraction Plants

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NFPA 58	Liquefied Petroleum Gas Code

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NFPA 70B	Recommended Practice for Electrical Equipment Maintenance

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	NFPA 497	Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas
513	NFPA 30	Flammable and Combustible Liquids Code

-

NFPA 33	Standard for Spray Application Using Flammable or Combustible Materials

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	NFPA 409	Standard on Aircraft Hangars
514	NFPA 2	Hydrogen Technologies Code

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NFPA 30A	Code for Motor Fuel Dispensing Facilities and Repair Garages

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NFPA 52	Vehicular Natural Gas Fuel Systems Code

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NFPA 58	Liquefied Petroleum Gas Code

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NFPA 59	Utility LP-Gas Plant Code

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	NFPA 303	Fire Protection Standard for Marinas and Boatyards
515	NFPA 30	Flammable and Combustible Liquids Code
516	NFPA 13	Standard for the Installation of Sprinkler Systems

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NFPA 33	Standard for Spray Application Using Flammable or Combustible Materials

-

NFPA 34	Standard for Dipping, Coating and Printing Processes Using Flammable or Combustible Liquids

-

NFPA 77	Recommended Practice on Static Electricity

-

NFPA 91	Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Particulate Solids

-

	NFPA 701	Standard Methods of Fire Tests for Flame Propagation of Textiles and Films
620	UL 4	Armored Cable

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UL 44	Thermoset-Insulated Wires and Cables

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UL 66	Fixture Wire

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UL 504	Mineral Insulated Wire

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UL 1063	Machine-Tool Wires and Cables

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	UL 1569	Metal Clad Cable
625	UL 3001	Distributed Energy Generation and Storage Systems

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	UL 3010	Single Site Energy Systems
630	UL 1276	Welding Cable
650	UL 1651	Optical Fiber Cable
660	UL 62	Flexible Cords and Cables

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	UL 817	Cord Sets and Power Supply Cords
668	UL 4	Armored Cable

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	UL 62	Flexible Cords and Cables
670	UL 2011	Machinery
675	UL 44	Thermoset-Insulated Wires and Cables

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UL 83	Thermoplastic-Insulated Wires and Cables

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UL 83A	Fluoropolymer Insulated Wire

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UL 1063	Machine-Tool Wires and Cables

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	UL 1263	Irrigation Cable
690	UL 3001	Distributed Energy Generation and Storage Systems

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	UL 3010	Single Site Energy Systems
691	UL 3001	Distributed Energy Generation and Storage Systems

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	UL 3010	Single Site Energy Systems
692	UL 44	Thermoset-Insulated Wires and Cables

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UL 83	Thermoplastic-Insulated Wires and Cables

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UL 83A	Fluoropolymer Insulated Wire

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UL 1063	Machine-Tool Wires and Cables

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	UL 3001	Distributed Energy Generation and Storage Systems

	UL 3010	Single Site Energy Systems
694	UL 44	Thermoset-Insulated Wires and Cables

UL 62	Flexible Cords and Cables

UL 83	Thermoplastic-Insulated Wires and Cables

UL 83A	Fluoropolymer Insulated Wire

UL 1063	Machine-Tool Wires and Cables

UL 3001	Distributed Energy Generation and Storage Systems

	UL 3010	Single Site Energy Systems
700	UL 3001	Distributed Energy Generation and Storage Systems
701	UL 3001	Distributed Energy Generation and Storage Systems
702	UL 3001	Distributed Energy Generation and Storage Systems
705	UL 3001	Distributed Energy Generation and Storage Systems

	UL 3010	Single Site Energy Systems
710	UL 3001	Distributed Energy Generation and Storage Systems

UL 3010	Single Site Energy Systems

Additional Proposed Changes

File Name	Description	Approved
NEC_Annex_A_Article_230_Absence_of_Voltage_Detection_Devices_submitted.docx	Added UL Standards to Annex A for Article 230	

Statement of Problem and Substantiation for Public Input

This is a companion proposal to the proposal for Section 230.82 which proposes a listing requirement for absence of voltage detection devices and absence of voltage testers. UL 61010-1 and UL 61010-2-030 are standards for absence of voltage detection devices, and UL 1436 is a standard which covers absence of voltage testers

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 1345-NFPA 70-2023 [Section No. 230.82]	Adds Listing requirement to 230.82 in new list item 13

Public Input No. 1345-NFPA 70-2023 [Section No. 230.82]

Submitter Information Verification

Submitter Full Name: John Kovacik
Organization: Trusted Safety Solutions LLC
Street Address:
City:
State:
Zip:
Submittal Date: Sun Jul 09 13:05:00 EDT 2023
Committee: NEC-P10

Committee Statement

Resolution: As these devices were not added to 230.82, there is no purpose in adding these standards to the list of referenced standards in Annex A.

PROPOSAL:

Table A.1(a) Product Safety Standards for Conductors and Equipment That Have an Associated Listing Requirement

Article	Standard Number	Standard Title
230	UL 61010-1	Electrical Equipment for Measurement, Control and Laboratory Use - Part 1: General Requirements
	UL 61010-2-030	Electrical Equipment for Measurement, Control, and Laboratory Use - Part 2-030: Particular Requirements for Testing and Measuring Circuits
	UL 1436	Outlet Circuit Testers and Other Similar Indicating Devices

RATONALE:

This is a companion proposal to the proposal for Section 230.82 which proposes a listing requirement for absence of voltage detection devices and absence of voltage testers. UL 61010-1 and UL 61010-2-030 are standards for absence of voltage detection devices, and UL 1436 is a standard which covers absence of voltage testers

Public Input No. 2581-NFPA 70-2023 [New Part after II.]

408.15 General. All switchboards and switchgear shall have a rating not less than the minimum feeder capacity required for the load calculated in accordance with Part III, IV, or V of Article 220, as applicable. The rating of the equipment considered for this requirement shall be the largest rating noted on the switchboard or switchgear label.

Statement of Problem and Substantiation for Public Input

The NEC has long required panelboards to be rated not less than the calculated loads the panelboard serves (408.30), but there is not a similar requirement for switchboards and switchgear. Jurisdictions (AHJs) can enforce proper sizing of feeder conductors per the calculated loads, but under the current and past editions of the NEC there is not a requirement to prevent someone from installing a switchboard or switchgear which has an overall rating less than the minimum rating of the feeders. Jurisdictions (AHJs) sometimes come across this issue and currently do not have any requirement they can point to in order to prevent under-rated switchboards or switchgear to be installed.

Submitter Information Verification

Submitter Full Name: Douglas Smith

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Street Address:

City:

State:

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Submittal Date: Tue Aug 22 22:30:55 EDT 2023

Committee: NEC-P10

Committee Statement

Resolution: FR-8970-NFPA 70-2024

Statement: Section 408.30 was moved to 408.14 and language has been added to ensure switchboards and switchgear are rated not less than the calculated loads. Changes were made to comply with 4.1.4 of the NEC Style Manual. Added “current” in front of “rating” to clarify the meaning.

Due to requirements of Section 408.30 being relocated to Section 408.14, the reference in 408.36 has been updated.