NATIONAL FIRE PROTECTION ASSOCIATION
The leading information and knowledge resource on fire, electrical and related hazards

NEC® Code-Making Panel 2 Second Draft Meeting Agenda

October 18 - 22, 2021

Microsoft Teams

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1. Call to Order, Chair
2. Introductions (Attachment A)
3. Approval of First Draft Meeting Minutes/Chair Report (Attachment B)
4. Staff Presentation, NFPA Staff
5. Review of Public Comments (Attachment C)
6. Old Business
7. New Business
8. Adjourn

Attachment A: Code-Making Panel Roster

Address List No Phone

09/17/2021
Jeffrey S. Sargent
NEC-P02

Code-Making Panel 2

National Electrical Code®

David G. Humphrey E 12/06/2019
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John McCamish L 08/17/2015
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Brett Larson **M** 08/17/2017

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Cesar Lujan **U** 04/11/2018

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Robert D. Osborne **RT** 08/17/2017

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Irozenell Pruitt **U** 08/11/2020

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Brian E. Rock **M** 08/11/2014

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Wiring Device-Kellems Division
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Principal: Thomas A. Domitrovich

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Principal: David G. Humphrey

Michael Weaver IM 08/11/2014
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National Electrical Contractors Association
Principal: Fred Neubauer

Douglas A. Lee C 7/20/2000
Nonvoting Member **NEC-P02**
US Consumer Product Safety Commission
5 Research Place
Rockville, MD 20850
US Consumer Product Safety Commission (CPSC)
Alternate: Einstein Miller

Einstein Miller C 04/14/2021
Alt. to Nonvoting Member **NEC-P02**
US Consumer Product Safety Commission (CPSC)
5 Research Place
Rockville, MD 20850
US Consumer Product Safety Commission (CPSC)
Principal: Douglas A. Lee

Jeffrey S. Sargent 08/31/2019
Staff Liaison **NEC-P02**
National Fire Protection Association
One Batterymarch Park
Quincy, MA 02169-7471

Attachment B: First Draft Meeting Minutes

NEC® Code-Making Panel 2 First Draft Chair Report

Signature: David G. Humphrey

Date of Meeting: January 11 – 16, 2021

1. List names of NEC® Code-Making Panel Members in Attendance: On file with staff.

2. List names of Guests in Attendance: On file with staff

3. List names of Guests who addressed the Panel, the subject of their presentation and the length of time they spoke:

   Merton Bunker-Opposition to AFCI Expansion Single Presentation
   Steven Rood – Legrande Elec. Opposition to AFCI Expansion
   (This presentation included a video presentation by **Jane Allred**) combined time: **(10 minutes)**

   Randal Dollar/Kevin Lippert – ACBMA In support of AFCI expansion **(9.5 minutes)**

   Charles Mello- Support of public input 3422 addressing weight supporting ceiling
   Mark Earley receptacles (wscr). Presenters combined two 10-minute time allotments **(17 minutes)**

   Walter Vernon – Mazzetti Eng. Support of PI 4219 addressing proposed 517 calculations **(10 minutes)**

   Robert Osborne – UL Report on Med. Voltage task group actions **(9 minutes)**

4. Number of Public Inputs acted upon. **PI 334**

5. Number of First Revisions Created: **FRs 83**

6. List any Task Groups appointed to work subsequent to the First Draft Meeting, along with the names of Task Group Chair/members:

   Task Group formed to identify number of injuries and age of injured from pulled electrical cords supplying countertop appliances. Practical solution if a problem is evidenced to exist.

   John McCamish-Chair
   Tom Domitrovich
   Michael Weaver
   Brian Rock
   David Humphrey

7. List any Public Input or First Revision that may need to be referred to another Panel for information or correlation:

a) PI 4661 to CMP 12.

b) PI 1144 to CMP 18

8. List any Public Input that requires NEC® Correlating Committee attention:

a) PI 3819 / CMP 2 voted first revision for the newly proposed medium voltage Art. 235

b) PI 4219/ CMP 2 voted first revision for section 517.22 creating demand factors for equipment in health care facilities. CMP 15 additionally voted first revision with different values that will require correlation.

c) PI 522 Article 100 change in definition for "bathroom" may impact CMP 15 and CMP 7 with regard to sections517.21 and 550.13(D)(9)

d) PI 2570 and PI 697 The term "class" was removed via first revision from the previous (voltage class) leaving just the word voltage from section 210.5(C)(1).
The definition of nominal voltage system may need to be reviewed to determine the relevancy of the use of that term (class) in the definition.

9. List any general requests for information or assistance from the NEC® Correlating Committee:

10. List any issues that should be brought to the attention of the NFPA Research Foundation:

Injuries across all age ranges resulting from electrical cords pulling appliances off of or from kitchen countertops.

11. List any additional information that would be helpful to the NEC® Correlating Committee, NFPA Staff, or process in general:

NEC CMP-2 First Draft Meeting Attendance

David Humphrey, *Chair*	Mathher Abbassi
Charles Boynton	Steve Campolo
Mark Cook	Thomas Domitrovich
Nehad El-Sherif	Thomas Harman
David Johnson	Cesar Lujan
Alan Manche	John McCamish
Fred Neubauer	Christopher Pavese
Frederick Reyes	William Crist
Andrew Kriegman	Brett Larson
Dave Mallay	Matthew McGouldrick
Daniel Naughton	Robert Osborne
Irozenell Pruitt	Brian Rock
Joseph Wages	Michael Weaver
Douglas Lee	Andrew Trotta
Jeffrey Sargent	Jacqueline Wilmot

Guests

Palmer Hickman	Dave Williams
Chuck Mello	Bryan Holland
David Hittinger	Ryan Jackson
Tim McClintock	Corey Hannahs
Mark Hilbert	Keith Waters
John Blissett	Don Ganiere
Megan Hayes	Joe Andre
Einstein Miller	Amy Cronin
Daniel Buuck	Mike Marsden
Randy Dollar	Keith Lofland
Mark Earley	Frank Tse
Ralph Baldwin	Todd Lottman
Quentin Cowans	Patty Barron
Steve Rood	Don Talka
Kevin Arnold	Kristen Koester
David Smith	Merton Bunker
Joe Bellantoni	Mike Monahan
Mark Hilbert	Sarah Caldwell
Mick Johnston	Larry Ayer
Russ Safreed	

Attachment C: Public Comment Report

Public Comment No. 894-NFPA 70-2021 [Global Input]

The Correlating Committee establishes a task group to review the term Ground-Fault Circuit Interrupter and other terminology associated with ground-fault protective equipment throughout the NEC to ensure consistency with how these are defined in Article 100. The Task Group will consist of members of CMP 2, 7, 10 and 17.

Additional Proposed Changes

File Name	Description	Approved
CN_160_Global.pdf	70_CN160	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 160 appeared in the First Draft Report.

The Correlating Committee establishes a task group to review the term Ground-Fault Circuit Interrupter and other terminology associated with ground-fault protective equipment throughout the NEC to ensure consistency with how these are defined in Article 100. The Task Group will consist of members of CMP 2, 7, 10 and 17.

Related Item

• Correlating Note No. 160

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 04 15:43:56 EDT 2021
Committee: NEC-P02

Correlating Committee Note No. 160-NFPA 70-2021 [Global Input]

Submitter Information Verification

Committee:

Submittal Date: Wed May 05 09:26:21 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee establishes a task group to review the term Ground-Fault Circuit Interrupter and other terminology associated with ground-fault protective equipment throughout the NEC to ensure consistency with how these are defined in Article 100. The Task Group will consist of members of CMP 2, 7, 10 and 17.

Ballot Results

This item has passed ballot

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

Affirmative All

Ayer, Lawrence S.

Gallo, Ernest J.

Hickman, Palmer L.

Holub, Richard A.

Hunter, Dean C.

Johnston, Michael J.

Kendall, David H.

Kovacik, John R.

Manche, Alan

McDaniel, Roger D.

Porter, Christine T.

Williams, David A.

Public Comment No. 1220-NFPA 70-2021 [Definition: Branch Circuit, Appliance.]

Branch Circuit, Appliance (Appliance Branch Circuit) .

A branch circuit that supplies energy to one or more outlets to which appliances are to be connected and that has no permanently connected luminaires that are not a part of an appliance. (CMP-2)

Statement of Problem and Substantiation for Public Comment

This public comment is a result of a CMP 2 task group focused on addressing identified style manual issues with definitions. This task group consisted of Thomas Domitrovich, Mathher Abbassi, Charles Boynton, Steve Campolo, Mark Cook, Nehad El-Sherif, Chris Pavese. This public comment addresses items identified by the Correlating Committee Usability Task Group which is leading the effort across CMPs 1 through 18 to bring all NEC definitions into compliance with the Style Manual. This change brings the definition into compliance with section 2.2.2.3.1, Defined Term, which requires the following: "To assist in electronic searching, the defined term shall then appear in parentheses as it would be found in the document"

Related Item

- FR 9324

Submitter Information Verification

Submitter Full Name: Thomas Domitrovich

Organization: Eaton Corporation

Street Address:

City:

State:

Zip:

Submittal Date: Tue Aug 10 21:07:51 EDT 2021

Committee: NEC-P02

Public Comment No. 1219-NFPA 70-2021 [Definition: Branch Circuit, General-Purpose.]

Branch Circuit, General-Purpose (General-Purpose Branch Circuit) .

A branch circuit that supplies two or more receptacles or outlets for lighting and appliances. (CMP-2)

Statement of Problem and Substantiation for Public Comment

This public comment is a result of a CMP 2 task group focused on addressing identified style manual issues with definitions. This task group consisted of Thomas Domitrovich, Mathher Abbassi, Charles Boynton, Steve Campolo, Mark Cook, Nehad El-Sherif, Chris Pavese. This public comment addresses items identified by the Correlating Committee Usability Task Group which is leading the effort across CMPs 1 through 18 to bring all NEC definitions into compliance with the Style Manual. This change brings the definition into compliance with section 2.2.2.3.1, Defined Term, which requires the following: "To assist in electronic searching, the defined term shall then appear in parentheses as it would be found in the document"

Related Item

- FR 9324

Submitter Information Verification

Submitter Full Name: Thomas Domitrovich
Organization: Eaton Corporation
Street Address:
City:
State:
Zip:

Submittal Date: Tue Aug 10 21:06:09 EDT 2021
Committee: NEC-P02

Public Comment No. 1218-NFPA 70-2021 [Definition: Branch Circuit, Individual.]

Branch Circuit, Individual (Individual Branch Circuit) .

A branch circuit that supplies only one utilization equipment. (CMP-2)

Statement of Problem and Substantiation for Public Comment

This public comment is a result of a CMP 2 task group focused on addressing identified style manual issues with definitions. This task group consisted of Thomas Domitrovich, Mathher Abbassi, Charles Boynton, Steve Campolo, Mark Cook, Nehad El-Sherif, Chris Pavese. This public comment addresses items identified by the Correlating Committee Usability Task Group which is leading the effort across CMPs 1 through 18 to bring all NEC definitions into compliance with the Style Manual. This change brings the definition into compliance with section 2.2.2.3.1, Defined Term, which requires the following: "To assist in electronic searching, the defined term shall then appear in parentheses as it would be found in the document"

Related Item

• FR 9324

Submitter Information Verification

Submitter Full Name:	Thomas Domitrovich
Organization:	Eaton Corporation
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Tue Aug 10 20:58:42 EDT 2021
Committee:	NEC-P02

Public Comment No. 747-NFPA 70-2021 [Definition: Continuous Load.]

Continuous Load.

A load ~~where the maximum current~~ that is expected to continue for 3 hours or more. (CMP-2)

Statement of Problem and Substantiation for Public Comment

While imperfect, i believe this wording addresses the concerns both of the CMP and of Mr. Harkins. No reasonable AHJ will take this as referring to phantom loads. At the same time, if a lighting system offers a theoretical maximum load of say 2 kW, but the management system installed restricts it to 1 kW all day, except for an hour in the evening when the cleaning crew is working and uses a manual override in each area while they mop it, the Continuous Load is, appropriately 1 kW, not the "maximum load." One could debate whether 1 kW really IS the maximum, but simply defining the continuous load as the load that operates for >= 3 hours simplifies the matter.

Related Item

- PI 141

Submitter Information Verification

Submitter Full Name:	David Shapiro
Organization:	Safety First Electrical
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Tue Aug 03 16:44:37 EDT 2021
Committee:	NEC-P02

Public Comment No. 1221-NFPA 70-2021 [Definition: Cooking Unit, Counter-Mounted.]

Cooking Unit, Counter-Mounted (Counter-Mounted Cooking Unit) .

A cooking appliance designed for mounting in or on a counter and consisting of one or more heating elements, internal wiring, and built-in or mountable controls. (CMP-2)

Statement of Problem and Substantiation for Public Comment

This public comment is a result of a CMP 2 task group focused on addressing identified style manual issues with definitions. This task group consisted of Thomas Domitrovich, Mathher Abbassi, Charles Boynton, Steve Campolo, Mark Cook, Nehad El-Sherif, Chris Pavese. This public comment addresses items identified by the Correlating Committee Usability Task Group which is leading the effort across CMPs 1 through 18 to bring all NEC definitions into compliance with the Style Manual. This change brings the definition into compliance with section 2.2.2.3.1, Defined Term, which requires the following: "To assist in electronic searching, the defined term shall then appear in parentheses as it would be found in the document"

Related Item

• FR 9324

Submitter Information Verification

Submitter Full Name: Thomas Domitrovich
Organization: Eaton Corporation
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City:
State:
Zip:

Submittal Date: Tue Aug 10 21:09:49 EDT 2021
Committee: NEC-P02

Public Comment No. 1051-NFPA 70-2021 [Definition: Laundry Area.]

Laundry Area.

An area containing or designed to contain a laundry ~~tray~~ sink , clothes washer, or clothes dryer. (CMP-2)

Statement of Problem and Substantiation for Public Comment

"Laundry tray" remains in the dictionary, but is not a commonly understood term any more than is "natural gray." I have data to back this up. Mr. Rock offers more readily understandable language than what is presently used, and there is no cost to improving usability by substituting his proposed term, "sink (basin)" just "laundry sink," or even "laundry sink (tray)."

Here's the data, from from The iWeb Corpus, a resource for searching the frequency of word and phrase use, checking 14 billion words, from more than 22 million web pages hosted on over 94 000 sites.

It reports these relative frequencies:

Laundry basin: 11
Laundry tray: 22
Laundry sink: 344

Another resource, "News on the Web," which includes web-available newspapers and magazines from 2010 forward to now, has 13+billion words. Here's what it reported for relative frequencies;

Laundry basin: 4
Laundry Tray: 0
Laundry Sink: 67

Let's update the Code definition to use language people understand without having to turn to a dictionary--or, more likely, guess.

Related Item

• PI 1823

Submitter Information Verification

Submitter Full Name:	David Shapiro
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City:	
State:	
Zip:	
Submittal Date:	Fri Aug 06 10:14:24 EDT 2021
Committee:	NEC-P02

Public Comment No. 2217-NFPA 70-2021 [New Definition after Definition: Corrosive Environment — Sw...]

Counter (Countertop).

A fixed or stationary surface that is typically intended for food preparation and serving, personal lavation or laundering or a similar surface that presents a routine risk of spillage of larger quantities of liquids upon outlets mounted directly on or in that surface. (406, 210)(CMP-18)

Informational Note: *Counters* and *Countertops* are distinguished from *Work Surfaces* ; see 406.5(E), 406.5(G)(1) and 406.5(H). See UL 498, *Standard for Receptacles and Attachment Plugs* , and UL 943, *Standard for Ground-Fault Circuit Interrupters* , establish for listed receptacle-outlet devices the performance evaluation and construction criteria [10 k-cycle mechanical endurance, mechanical loading, ½-gallon (1.89-L) spillage if retracted or when unretracted with and without attachment plugs inserted].

Statement of Problem and Substantiation for Public Comment

The additions of these definitions [Counter (Countertop) and Work Surface] are proffered to improve usability of the Code.

.

Within the various product safety standards for listed electrical outlet products applicable to counters and countertops versus those applicable solely to work surfaces, the differences in listing requirements are readily evident, both in terms of breadth and severity of those requirements, to those manufacturers, certification bodies (CBs), and standards development organizations (SDOs) directly involved with the listing of such electrical outlet products. The NEC®, however, provides no information as to how these applications, and these products accordingly, differ from one another.

.

Throughout the NEC®, strong distinction exists as to which equipment is suitable for which specific application is made:

- without any definitions whatsoever as to how Counters and Countertops differ from Work Surfaces, and
- without any Informational Notes to explain how the products suitable for each application are differently evaluated from one another.

In the complete absence within the NEC® of this differentiating information, there's considerable installer and enforcement confusion, and frequent product misapplications result. In some installations, products fully unsuitable and unlisted for either Countertop or Work Surface application are utilized and wrongly approved.

.

Although not explicitly stated [as it is for approval of Article Scopes (2.2.1)] in the 2020 NEC® Style Manual, it is recognized that the NEC® Correlating Committee has ultimate authority for assignment of which Code-Making Panel becomes responsible for a definition applicable to multiple Articles. CMP-18 is recommended for such CMP assignments for these new definitions based upon products (Article 406, CMP-18) rather than upon installation usage (Article 210, CMP-2).

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 2219-NFPA 70-2021 [New Definition after Definition: Wireways, Nonmetallic. (No...]	differentiated definition
Public Comment No. 2219-NFPA 70-2021 [New Definition after Definition: Wireways, Nonmetallic. (No...]	

Related Item

- Committee Input No. 9338-NFPA 70-2021

Submitter Information Verification

Submitter Full Name: Brian Rock
Organization: Hubbell Incorporated
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 19 17:04:07 EDT 2021
Committee: NEC-P02

Public Comment No. 2219-NFPA 70-2021 [New Definition after Definition: Wireways, Nonmetallic. (No...]

Work Surface.

A fixed, stationary, or portable surface that is typically intended for dry use and for tasks other than food preparation, personal lavation or laundering and that presents an incidental risk of spillage of smaller quantities of beverages and other liquids upon outlets mounted directly on or recessed in that surface. (406, 210) (CMP-18)

Informational Note: Work Surfaces is distinguished from Counters and Countertops; see 406.5(F), 406.5(G)(1) and 406.5(H). See *UL 111, Standard for Multioutlet Assemblies* , and *UL 962A, Standard for Furniture Power Distribution Units* , established for listed receptacle devices the performance evaluation and construction criteria [2.5 k-cycle mechanical endurance, 8-ounce (237- mL) spillage when a non-self-closing cover is opened and if a self-closing cover is tested with and without attachment plugs inserted].

Statement of Problem and Substantiation for Public Comment

The additions of these definitions [Work Surface and Counter (Countertop)] are proffered to improve usability of the Code.

.

Within the various product safety standards for listed electrical outlet products applicable to counters and countertops versus those applicable solely to work surfaces, the differences in listing requirements are readily evident, both in terms of breadth and severity of those requirements, to those manufacturers, certification bodies (CBs), and standards development organizations (SDOs) directly involved with the listing of such electrical outlet products. The NEC®, however, provides no information as to how these applications, and these products accordingly, differ from one another.

.

Throughout the NEC®, strong distinction exists as to which equipment is suitable for which specific application is made without any definitions whatsoever as to how Counters and Countertops differ from Work Surfaces, and without any Informational Notes to explain how the products suitable for each application are differently evaluated from one another.

.

In the complete absence within the NEC® of this differentiating information, there’s considerable installer and enforcement confusion, and frequent product misapplications result. In some installations, products fully unsuitable and unlisted for either Countertop or Work Surface application are utilized and wrongly approved.

.

Although not explicitly stated [as it is for approval of Article Scopes (2.2.1)] in the 2020 NEC® Style Manual, it is recognized that the NEC® Correlating Committee has ultimate authority for assignment of which Code-Making Panel becomes responsible for a definition applicable to multiple Articles. CMP-18 is recommended for such CMP assignments for these new definitions based upon products (Article 406, CMP-18) rather than installation usage (Article 210, CMP-2).

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 2217-NFPA 70-2021 [New Definition after Definition: Corrosive Environment — Sw...]	differentiated definition
Public Comment No. 2217-NFPA 70-2021 [New Definition after Definition: Corrosive Environment — Sw...]	

Related Item

- Committee Input No. 9339-NFPA 70-2021

Submitter Information Verification

Submitter Full Name: Brian Rock
Organization: Hubbell Incorporated
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 19 17:20:04 EDT 2021
Committee: NEC-P02

Public Comment No. 1292-NFPA 70-2021 [Section No. 210.1]

210.1 Scope.

This article provides the general requirements for branch circuits.

Informational Note: ~~For requirements~~ See Article 235 for requirements that supplement or modify this article for installations over 1000 Vac ~~, 1500 Vdc installations, see Article 235~~ or 1500 Vdc .

Statement of Problem and Substantiation for Public Comment

Just an editorial revision to make it read better, and to satisfy the style manual.

Related Item

- FR 9180

Submitter Information Verification

Submitter Full Name:	Ryan Jackson
Organization:	Ryan Jackson
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Aug 11 16:17:36 EDT 2021
Committee:	NEC-P02

Public Comment No. 652-NFPA 70-2021 [Article 100]

Article 100 Definitions

Scope. This article contains only those definitions essential to the application of this *Code*. It is not intended to include commonly defined general terms or commonly defined technical terms from related codes and standards. An article number in parentheses following the definition indicates that the definition only applies to that article.

Informational Note: A definition that is followed by a reference in brackets has been extracted from one of the following standards. Only editorial changes were made to the extracted text to make it consistent with this *Code*.

(1) NFPA 30A-2021, *Code for Motor Fuel Dispensing Facilities and Repair Garages*

(2) NFPA 33-2021, *Standard for Spray Application Using Flammable or Combustible Materials*

(3) NFPA 75-2020, *Standard for the Fire Protection of Information Technology Equipment*

(4) NFPA 79-2021, *Electrical Standard for Industrial Machinery*

(5) NFPA 99-2021, *Health Care Facilities Code*

(6) NFPA *101*® -2021, *Life Safety Code*®

(7) NFPA 110-2019, *Emergency and Standby Power Systems*

(8) NFPA 303-2021, *Fire Protection Standard for Marinas and Boatyards*

(9) NFPA 307-2021, *Standard for the Construction and Fire Protection of Marine Terminals, Piers, and Wharves*

(10) NFPA 501-2017, *Standard on Manufactured Housing*

(11) NFPA 790-2021, *Standard for Competency of Third-Party Field Evaluation Bodies*

(12) NFPA 1192-2021, *Standard on Recreational Vehicles*

Abandoned Class 2, Class 3, and PLTC Cable.

Installed Class 2, Class 3, and PLTC cable that is not terminated at equipment and not identified for future use with a tag. (CMP-3)

Abandoned Fire Alarm Cable.

Installed fire alarm cable that is not terminated at equipment other than a connector and not identified for future use with a tag. (CMP-3)

AC Module (Alternating-Current Module).

A complete, environmentally protected unit consisting of solar cells, inverter, and other components, designed to produce ac power. (690) (CMP-4)

AC Module System.

An assembly of ac modules, wiring methods, materials, and subassemblies that are evaluated, identified, and defined as a system. (690) (CMP-4)

Accessible (as applied to equipment).

Capable of being reached for operation, renewal, and inspection. (CMP-1)

Accessible (as applied to wiring methods).

Capable of being removed or exposed without damaging the building structure or finish or not permanently closed in or blocked by the structure, other electrical equipment, other building systems, or finish of the building. (CMP-1)

Accessible, Readily. (Readily Accessible)

Capable of being reached quickly for operation, renewal, or inspections without requiring those to whom ready access is requisite to take actions such as to use tools (other than keys), to climb over or under, to remove obstacles, or to resort to portable ladders, and so forth. (CMP-1)

Informational Note: Use of keys is a common practice under controlled or supervised conditions and a common alternative to the ready access requirements under such supervised conditions as provided elsewhere in the NEC.

Adapter.

A device used to adapt a circuit from one configuration of an attachment plug or receptacle to another configuration with the same current rating. (520) (CMP-15)

Adjustable Speed Drive.

Power conversion equipment that provides a means of adjusting the speed of an electric motor. (CMP-11)

Informational Note: A variable frequency drive is one type of electronic adjustable speed drive that controls the rotational speed of an ac electric motor by controlling the frequency and voltage of the electrical power supplied to the motor.

Adjustable Speed Drive System.

A combination of an adjustable speed drive, its associated motor(s), and auxiliary equipment. (CMP-11)

Air-Conditioning or Comfort-Cooling Equipment.

All of that equipment intended or installed for the purpose of processing the treatment of air so as to control simultaneously or individually its temperature, humidity, cleanliness, and distribution to meet the requirements of the conditioned space. (555) (CMP-7)

Aircraft Painting Hangar.

An aircraft hangar constructed for the express purpose of spraying, coating, and/or dipping applications and provided with dedicated ventilation supply and exhaust. (513) (CMP-14)

Alternate Power Source.

One or more generator sets, or battery systems where permitted, intended to provide power during the interruption of the normal electrical service; or the public utility electrical service intended to provide power during interruption of service normally provided by the generating facilities on the premises. [**99:** 3.3.4] (517) (CMP-15)

Alternating-Current Power Distribution Box (Alternating-Current Plugging Box) (Scatter Box).

An ac distribution center or box that contains one or more grounding-type polarized receptacles that can contain overcurrent protective devices. (530) (CMP-15)

Ambulatory Health Care Occupancy.

An occupancy used to provide services or treatment simultaneously to four or more patients that provides, on an outpatient basis, one or more of the following:

(1) Treatment for patients that renders the patients incapable of taking action for self-preservation under emergency conditions without the assistance of others.

(2) Anesthesia that renders the patients incapable of taking action for self-preservation under emergency conditions without the assistance of others.

(3) Treatment for patients who, due to the nature of their injury or illness, are incapable of taking action for self-preservation under emergency conditions without the assistance of others.

[***101*** :3.3.198.1] (517) (CMP-15)

Ampacity.

The maximum current, in amperes, that a conductor can carry continuously under the conditions of use without exceeding its temperature rating. (CMP-6)

Amplifier (Audio Amplifier) (Pre-Amplifier).

Electronic equipment that increases the current or voltage, or both, of an audio signal intended for use by another piece of audio equipment. Amplifier is the term used within this article to denote an audio amplifier. (640) (CMP-12)

Anesthetizing Location.

Any space within a facility that has been designatedfor the administration of any flammable or nonflammable inhalation anesthetic agent during examination or treatment, including the use of such agents for relative analgesia. (517) (CMP-15)

Appliance.

Utilization equipment, generally other than industrial, that is normally built in standardized sizes or types and is installed or connected as a unit to perform one or more functions such as clothes washing, air-conditioning, food mixing, deep frying, and so forth. (CMP-17)

Appliance, Fixed. (Fixed Appliance)

An appliance that is fastened or otherwise secured at a specific location. (CMP-7)

Appliance, Portable. (Portable Appliance)

An appliance that is actually moved or can easily be moved from one place to another in normal use. (550) (CMP-7)

Informational Note: For the purpose of this article, the following major appliances, other than built-in, are considered portable if cord connected: refrigerators, range equipment, clothes washers, dishwashers without booster heaters, or other similar appliances.

Applicator.

The device used to transfer energy between the output circuit and the object or mass to be heated. (665) (CMP-12)

Approved.

Acceptable to the authority having jurisdiction. (CMP-1)

Arc-Fault Circuit Interrupter (AFCI).

A device intended to provide protection from the effects of arc faults by recognizing characteristics unique to arcing and by functioning to de-energize the circuit when an arc fault is detected. (CMP-2)

Armored Cable, Type AC.

A fabricated assembly of insulated conductors in a flexible interlocked metallic armor. (CMP-6)

Array.

A mechanically and electrically integrated grouping of modules with support structure, including any attached system components such as inverter(s) or dc-to-dc converter(s) and attached associated wiring. (690) (CMP-4)

Artificially Made Bodies of Water.

Bodies of water that have been constructed or modified to fit some decorative or commercial purpose such as, but not limited to, aeration ponds, fish farm ponds, storm retention basins, treatment ponds, and irrigation (channel) facilities. Water depths may vary seasonally or be controlled. (682) (CMP-17)

Askarel.

A generic term for a group of nonflammable synthetic chlorinated hydrocarbons used as electrical insulating media. (CMP-9)

Informational Note: Askarels of various compositional types are used. Under arcing conditions, the gases produced, while consisting predominantly of noncombustible hydrogen chloride, can include varying amounts of combustible gases, depending on the askarel type.

Associated Apparatus.

Apparatus in which the circuits are not necessarily intrinsically safe themselves but that affects the energy in the intrinsically safe circuits and is relied on to maintain intrinsic safety. Such apparatus is one of the following:

(1) Electrical apparatus that has an alternative type of protection for use in the appropriate hazardous (classified) location

(2) Electrical apparatus not so protected that shall not be used within a hazardous (classified) location

(CMP-14)

> Informational Note No. 1: Associated apparatus has identified intrinsically safe connections for intrinsically safe apparatus and also might have connections for nonintrinsically safe apparatus.

> Informational Note No. 2: An example of associated apparatus is an intrinsic safety barrier, which is a network designed to limit the energy (voltage and current) available to the protected circuit in the hazardous (classified) location under specified fault conditions.

Associated Nonincendive Field Wiring Apparatus.

Apparatus in which the circuits are not necessarily nonincendive themselves but that affects the energy in nonincendive field wiring circuits and is relied upon to maintain nonincendive energy levels. Such apparatus is one of the following:

(1) Electrical apparatus that has an alternative type of protection for use in the appropriate hazardous (classified) location

(2) Electrical apparatus not so protected that shall not be used in a hazardous (classified) location

(500) (CMP-14)

> Informational Note: Associated nonincendive field wiring apparatus has designated associated nonincendive field wiring apparatus connections for nonincendive field wiring apparatus and may also have connections for other electrical apparatus.

Attachment Fitting, Weight Supporting (WSAF).

A device that, by insertion into a weight supporting ceiling receptacle, establishes a connection between the conductors of the attached utilization equipment and the branch-circuit conductors connected to the weight supporting ceiling receptacle. (CMP-18)

> Informational Note: A weight supporting attachment fitting is different from an attachment plug because no cord is associated with the fitting. A weight supporting attachment fitting in combination with a weight supporting ceiling receptacle secures the associated utilization equipment in place and supports its weight.

Attachment Plug (Plug Cap) (Plug).

A device that, by insertion in a receptacle, establishes a connection between the conductors of the attached flexible cord and the conductors connected permanently to the receptacle. (CMP-18)

Audio Autotransformer.

A transformer with a single winding and multiple taps intended for use with an amplifier loudspeaker signal output. (640) (CMP-12)

Audio Signal Processing Equipment.

Electrically operated equipment that produces, processes, or both, electronic signals that, when appropriately amplified and reproduced by a loudspeaker, produce an acoustic signal within the range of normal human hearing (typically 20–20 kHz). Within this article, the terms equipment and audio equipment are assumed to be equivalent to audio signal processing equipment. (640) (CMP-12)

> Informational Note: This equipment includes, but is not limited to, loudspeakers; headphones; pre-amplifiers; microphones and their power supplies; mixers; MIDI (musical instrument digital interface) equipment or other digital control systems; equalizers, compressors, and other audio signal processing equipment; and audio media recording and playback equipment, including turntables, tape decks and disk players (audio and multimedia), synthesizers, tone generators, and electronic organs. Electronic organs and synthesizers may have integral or separate amplification and loudspeakers. With the exception of amplifier outputs, virtually all such equipment is used to process signals (using analog or digital techniques) that have nonhazardous levels of voltage or current.

Audio System.

Within this article, the totality of all equipment and interconnecting wiring used to fabricate a fully functional audio signal processing, amplification, and reproduction system. (640) (CMP-12)

Audio Transformer.

A transformer with two or more electrically isolated windings and multiple taps intended for use with an amplifier loudspeaker signal output. (640) (CMP-12)

Authority Having Jurisdiction (AHJ).

An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure. (CMP-1)

> Informational Note: The phrase "authority having jurisdiction," or its acronym AHJ, is used in NFPA documents in a broad manner, since jurisdictions and approval agencies vary, as do their responsibilities. Where public safety is primary, the authority having jurisdiction may be a federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the authority having jurisdiction. In many circumstances, the property owner or his or her designated agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction.

Automatic.

Performing a function without the necessity of human intervention. (CMP-1)

Basement

Any story of a building or structure wholly or partly below grade

Bathroom.

An area including a sink with one or more of the following: a toilet, a urinal, a tub, a shower, a bidet, or similar plumbing fixtures. (CMP-2)

Battery.

A single cell or a group of cells connected together electrically in series, in parallel, or a combination of both. (CMP-13)

Battery, Flow. (Flow Battery)

An energy storage component that stores its active materials in the form of one or two electrolytes external to the reactor interface. When in use, the electrolytes are transferred between reactor and storage tanks. (706) (CMP-13)

> Informational Note: Three commercially available flow battery technologies are zinc air, zinc bromine, and vanadium redox, sometimes referred to as *pumped electrolyte ESS* .

Battery, Sealed. (Sealed Battery)

A battery that has no provision for the routine addition of water or electrolyte or for external measurement of electrolyte specific gravity and might contain pressure relief venting. (CMP-13)

Battery, Stationary Standby (Stationary Standby Battery).

A battery that spends the majority of the time on continuous float charge or in a high state of charge, in readiness for a discharge event. (CMP-13)

> Informational Note: Uninterruptible Power Supply (UPS) batteries are an example that falls under this definition.

Battery-Powered Lighting Units.

Individual unit equipment for backup illumination consisting of a rechargeable battery; a battery-charging means; provisions for one or more lamps mounted on the equipment, or with terminals for remote lamps, or both; and a relaying device arranged to energize the lamps automatically upon failure of the supply to the unit equipment. (517) (CMP-15)

Berth.

The water space to be occupied by a boat or other vessel alongside or between bulkheads, piers, piles, fixed and floating docks, or any similar access structure. (See also Slip.) [**303:** 3.3.1] (555) (CMP-7)

Bipolar Circuit.

A dc circuit that is comprised of two monopole circuits, each having an opposite polarity connected to a common reference point. (CMP-4)

Boatyard.

A facility used for constructing, repairing, servicing, hauling from the water, storing (on land and in water), and launching of boats. [**303:** 3.3.2] (555) (CMP-7)

Bonded (Bonding).

Connected to establish electrical continuity and conductivity. (CMP-5)

Bonding Conductor or Jumper (BJ).

A conductor that ensures the required electrical conductivity between metal parts that are required to be electrically connected. (CMP-5)

Bonding Jumper, Equipment (EBJ).

The connection between two or more portions of the equipment grounding conductor. (CMP-5)

Bonding Jumper, Main (MBJ).

The connection between the grounded circuit conductor and the equipment grounding conductor, or the supply-side bonding jumper, or both, at the service. (CMP-5)

Bonding Jumper, Supply-Side (SSBJ).

A conductor installed on the supply side of a service or within a service equipment enclosure(s), or for a separately derived system, that ensures the required electrical conductivity between metal parts required to be electrically connected. (CMP-5)

Bonding Jumper, System (SBJ).

The connection between the grounded circuit conductor and the supply-side bonding jumper, or the equipment grounding conductor, or both, at a separately derived system. (CMP-5)

Border Light.

A permanently installed overhead strip light. (520) (CMP-15)

Bottom Shield, Type FCC.

A protective layer that is installed between the floor and Type FCC flat conductor cable to protect the cable from physical damage and may or may not be incorporated as an integral part of the cable. (324) (CMP-6)

Branch Circuit.

The circuit conductors between the final overcurrent device protecting the circuit and the outlet(s). (CMP-2)

Branch Circuit, Appliance.

A branch circuit that supplies energy to one or more outlets to which appliances are to be connected and that has no permanently connected luminaires that are not a part of an appliance. (CMP-2)

Branch Circuit, General-Purpose.

A branch circuit that supplies two or more receptacles or outlets for lighting and appliances. (CMP-2)

Branch Circuit, Individual.

A branch circuit that supplies only one utilization equipment. (CMP-2)

Branch Circuit, Motor.

The circuit conductors, including equipment, between the motor branch-circuit short-circuit ground-fault protective device and an individual motor. (CMP-11)

Branch Circuit, Multiwire. (Multiwire Branch Circuit)

A branch circuit that consists of two or more ungrounded conductors that have a voltage between them, and a neutral conductor that has equal voltage between it and each ungrounded conductor of the circuit and that is connected to the neutral conductor of the system. (CMP-2)

Branch-Circuit Selection Current (BCSC) (as applied to air-conditioning and refrigerating equipment).

The value in amperes to be used instead of the rated-load current in determining the ratings of motor branch-circuit conductors, disconnecting means, controllers, and branch-circuit short-circuit and ground-fault protective devices wherever the running overload protective device permits a sustained current greater than the specified percentage of the rated-load current. The value of branch-circuit selection current will always be equal to or greater than the marked rated-load current. (440) (CMP-11)

Breakout Assembly.

An adapter used to connect a multipole connector containing two or more branch circuits to multiple individual branch-circuit connectors. (520) (CMP-15)

Broadband.

Wide bandwidth data transmission that transports multiple signals, protocols, and traffic types over various media types. (CMP-16)

Block.

A square or portion of a city, town, or village enclosed by streets and including the alleys so enclosed, but not any street. (800) (CMP-16)

Building.

A structure that stands alone or that is separated from adjoining structures by fire walls. (CMP-1)

Building, Floating. (Floating Building)

A building unit, as defined in Article 100, that floats on water, is moored in a permanent location, and has a premises wiring system served through connection by permanent wiring to an electrical supply system not located on the premises. (555) (CMP-7)

Building, Manufactured. (Manufactured Building)

Any building that is of closed construction and is made or assembled in manufacturing facilities on or off the building site for installation, or for assembly and installation on the building site, other than manufactured homes, mobile homes, park trailers, or recreational vehicles. (545) (CMP-7)

Building Component.

Any subsystem, subassembly, or other system designed for use in or integral with or as part of a structure, which can include structural, electrical, mechanical, plumbing, and fire protection systems, and other systems affecting health and safety. (545) (CMP-7)

Building System.

Plans, specifications, and documentation for a system of manufactured building or for a type or a system of building components, which can include structural, electrical, mechanical, plumbing, and fire protection systems, and other systems affecting health and safety, and including such variations thereof as are specifically permitted by regulation, and which variations are submitted as part of the building system or amendment thereto. (545) (CMP-7)

Bulkhead.

A vertical structural wall, usually of stone, timber, metal, concrete, or synthetic material, constructed along, and generally parallel to, the shoreline to retain earth as an extension of the upland, and often to provide suitable water depth at the waterside face. [**303:** 3.3.4] (555) (CMP-7)

Bull Switch.

An externally operated wall-mounted safety switch that can contain overcurrent protection and is designed for the connection of portable cables and cords. (530) (CMP-15)

Bundled.

Cables or conductors that are tied, wrapped, taped, or otherwise periodically bound together. (520) (CMP-15)

Busbar.

A noninsulated conductor electrically connected to the source of supply and physically supported on an insulator providing a power rail for connection to utilization equipment, such as sensors, actuators, A/V devices, low-voltage luminaire assemblies, and similar electrical equipment. (393) (CMP-18)

Busbar Support.

An insulator that runs the length of a section of suspended ceiling bus rail that serves to support and isolate the busbars from the suspended grid rail. (393) (CMP-18)

Busway.

A raceway consisting of a metal enclosure containing factory-mounted, bare or insulated conductors, which are usually copper or aluminum bars, rods, or tubes. (CMP-8)

Cabinet.

An enclosure that is designed for either surface mounting or flush mounting and is provided with a frame, mat, or trim in which a swinging door or doors are or can be hung. (CMP-9)

Cable.

A factory assembly of two or more conductors having an overall covering. (CMP-16)

Cable, Abandoned. (Abandoned Cable)

Installed cable that is not terminated at equipment or is not identified for future use with a tag. (800) (CMP-16)

Cable, Abandoned Audio Distribution. (Abandoned Audio Distribution Cable)

Installed audio distribution cable that is not terminated at equipment and not identified for future use with a tag. (640) (CMP-12)

Cable, Abandoned Supply Circuits and Interconnecting. (Abandoned Supply Circuits and Interconnecting Cables)

Installed supply circuits and interconnecting cables that are not terminated at equipment and not identified for future use with a tag. (645) (CMP-12)

Cable, Coaxial. (Coaxial Cable)

A cylindrical assembly composed of a conductor centered inside a metallic tube or shield, separated by a dielectric material, and usually covered by an insulating jacket. (CMP-16)

Cable, Communications Circuit Integrity (CI). (Communications Circuit Integrity Cable)

Cable used in communications systems to ensure continued operation of critical circuits during a specified time under fire conditions. (805) (CMP-16)

Cable, Festoon. (Festoon Cable)

Single- and multiple-conductor cable intended for use and installation in accordance with Article 610 where flexibility is required. (610) (CMP-12)

Cable, Medium Voltage, Type MV.

A single or multiconductor solid dielectric insulated cable rated 2001 volts up to and including 35,000 volts, nominal. (CMP-6)

Cable, Optical Fiber, Abandoned. (Abandoned Optical Fiber Cable)

Installed optical fiber cable that is not terminated at equipment other than a connector and not identified for future use with a tag. (770) (CMP-16)

Cable, Optical Fiber. (Optical Fiber Cable)

A factory assembly or field assembly of one or more optical fibers having an overall covering. (CMP-16)

> Informational Note: A field-assembled optical fiber cable is an assembly of one or more optical fibers within a jacket. The jacket, without optical fibers, is installed in a manner similar to conduit or raceway. Once the jacket is installed, the optical fibers are inserted into the jacket, completing the cable assembly.

Cable, Optical Fiber, Conductive. (Conductive Optical Fiber Cable)

A factory assembly of one or more optical fibers having an overall covering and containing non-current-carrying conductive member(s) such as metallic strength member(s), metallic vapor barrier(s), metallic armor, or metallic sheath. (CMP-16)

Cable, Optical Fiber, Hybrid. (Hybrid Optical Fiber Cable)

A cable containing optical fibers and current-carrying electrical conductors. (CMP-16)

Cable, Optical Fiber, Nonconductive. (Nonconductive Optical Fiber Cable)

A factory assembly of one or more optical fibers having an overall covering and containing no electrically conductive materials. (CMP-16)

Cable, Portable Power Feeder. (Portable Power Feeder Cable)

One or more flexible shielded insulated power conductors enclosed in a flexible covering that provides mechanical protection with voltage rating from 2000 to 25,000 volts. (CMP-6)

Cable Bundle.

A group of cables that are tied together or in contact with one another in a closely packed configuration for at least 1.0 m (40 in.). (CMP-3)

> Informational Note: Random or loose installation of individual cables can result in less heating. Combing of the cables can result in less heat dissipation and more signal cross talk between cables.

Cable Connector [as applied to hazardous (classified) locations].

An electrical device that is part of a cable assembly and that, by insertion of two mating configurations, establishes a connection between the conductors of the cable assembly and the conductors of a fixed piece of equipment.

> Informational Note: For unclassified locations, such cable connectors are referred to as male and female fittings. Examples of standards for such male and female fittings include ANSI/UL 2238-2018, *Cable Assemblies and Fittings for Industrial Control and Signal Distribution* , and ANSI/UL 2237-2019, *Multi-Point Interconnection Power Cable Assemblies for Industrial Machinery* .

Cable Connector, Type FCC.

A connector designed to join Type FCC cables without using a junction box. (324) (CMP-6)

Cable Joint, Type MV.

A connection consisting of an insulation system and a connector where two (or more) cables are joined together in a way that is to be chemically, mechanically, and electrically stable. (CMP-6)

Cable Management System.

An apparatus designed to control and organize unused lengths of cable or cord at electrified truck parking spaces. (CMP-12)

Cable Routing Assembly.

A single channel or connected multiple channels, as well as associated fittings, forming a structural system that is used to support and route communications wires and cables, optical fiber cables, data cables associated with information technology and communications equipment, Class 2, Class 3, and Type PLTC cables, and power-limited fire alarm cables in plenum, riser, and general-purpose applications. (CMP-16)

Cable Sheath (as applied to metallic conductor cables).

A covering over the conductor assembly that may include one or more metallic members, strength members, or jackets. (CMP-16)

Cable Sheath, Optical Fiber. (Optical Fiber Cable Sheath)

A covering over the optical fiber assembly that includes one or more jackets and may include one or more metallic members or strength members. (CMP-16)

Cable Termination, Type MV.

A connection consisting of an insulation system and a connector and installed on a Type MV cable to connect from a cable to a device, such as equipment, in a way that is to be chemically, mechanically, and electrically stable. (CMP-6)

Cable Tray System.

A unit or assembly of units or sections and associated fittings forming a structural system used to securely fasten or support cables and raceways. (CMP-8)

Cablebus.

An assembly of units or sections with insulated conductors having associated fittings forming a structural system used to securely fasten or support conductors and conductor terminations in a completely enclosed, ventilated, protective metal housing. This assembly is designed to carry fault current and to withstand the magnetic forces of such current. (CMP-8)

> Informational Note: Cablebus is ordinarily assembled at the point of installation from the components furnished or specified by the manufacturer in accordance with instructions for the specific job.

Cell (as applied to batteries).

The basic electrochemical unit, characterized by an anode and a cathode, used to receive, store, and deliver electrical energy. (CMP-13)

Cell, Raceway. (Raceway Cell)

A single enclosed tubular space in a cellular metal or concrete floor member, the axis of the cell being parallel to the axis of the floor member. (CMP-8)

Cell, Sealed. (Sealed Cell)

A cell that has no provision for the routine addition of water or electrolyte or for external measurement of electrolyte specific gravity and might contain pressure relief venting. (CMP-13)

Cell Line.

An assembly of electrically interconnected electrolytic cells supplied by a source of direct-current power. (668) (CMP-12)

Cell Line Attachments and Auxiliary Equipment.

A term that includes, but is not limited to, auxiliary tanks; process piping; ductwork; structural supports; exposed cell line conductors; conduits and other raceways; pumps, positioning equipment, and cell cutout or bypass electrical devices. Auxiliary equipment includes tools, welding machines, crucibles, and other portable equipment used for operation and maintenance within the electrolytic cell line working zone. In the cell line working zone, auxiliary equipment includes the exposed conductive surfaces of ungrounded cranes and crane-mounted cell-servicing equipment. (668) (CMP-12)

Charge Controller.

Equipment that controls dc voltage or dc current, or both, and that is used to charge a battery or other energy storage device. (CMP-13)

Charger Power Converter.

The device used to convert energy from the power grid to a high-frequency output for wireless power transfer. (625) (CMP-12)

Child Care Facility.

A building or structure, or portion thereof, for educational, supervisory, or personal care services for more than four children 7 years old or less. (406) (CMP-18)

(CATV) Circuit, Premises Community Antenna Television. [Premises Community Antenna Television (CATV) Circuit]

The circuit that extends community antenna television (CATV) systems for audio, video, data, and interactive services from the service provider's network terminal to the appropriate customer equipment. (CMP-16)

Circuit Breaker.

A device designed to open and close a circuit by nonautomatic means and to open the circuit automatically on a predetermined overcurrent without damage to itself when properly applied within its rating. (CMP-10)

Informational Note: The automatic opening means can be integral, direct acting with the circuit breaker, or remote from the circuit breaker.

Circuit Breaker, Adjustable. (Adjustable Circuit Breaker)

A qualifying term indicating that the circuit breaker can be set to trip at various values of current, time, or both, within a predetermined range. (CMP-10)

Circuit Breaker, Instantaneous Trip. (Instantaneous Trip Circuit Breaker)

A qualifying term indicating that no delay is purposely introduced in the tripping action of the circuit breaker. (CMP-10)

Circuit Breaker, Inverse Time. (Inverse Time Circuit Breaker)

A qualifying term indicating that there is a delay purposely introduced in the tripping action of the circuit breaker, and the delay decreases as the magnitude of the current increases. (CMP-10)

Circuit Breaker, Nonadjustable. (Nonadjustable Circuit Breaker)

A qualifying term indicating that the circuit breaker does not have any adjustment to alter the value of the current at which it will trip or the time required for its operation. (CMP-10)

Circuit Integrity (CI) Cable.

Cable(s) marked with the suffix "-CI" used for remote-control, signaling, power-limited, fire alarm, optical fiber, or communications systems that supply critical circuits to ensure survivability for continued circuit operation for a specified time under fire conditions. (CMP-3)

Informational Note: See 728.4 for power circuits installed for survivability.

Class 1 Circuit.

The portion of the wiring system between the load side of the Class 1 power source and the connected equipment. (CMP-3)

Class 2 Circuit.

The portion of the wiring system between the load side of a Class 2 power source and the connected equipment. Due to its power limitations, a Class 2 circuit considers safety from a fire initiation standpoint and provides acceptable protection from electric shock. (CMP-3)

Class 3 Circuit.

The portion of the wiring system between the load side of a Class 3 power source and the connected equipment. Due to its power limitations, a Class 3 circuit considers safety from a fire initiation standpoint. Since higher levels of voltage and current than for Class 2 are permitted, additional safeguards are specified to provide protection from an electric shock hazard that could be encountered. (CMP-3)

Class 4 Circuit.

The portion of the wiring system between the load side of a Class 4 transmitter and the Class 4 receiver or Class 4 utilization equipment, as appropriate. Due to the active monitoring and control of the power transmitted, a Class 4 circuit is not considered a possible ignition source, and it minimizes the risk of electric shock. (CMP-3)

Class 4 Device.

Any active device connected to the Class 4 circuit; examples include a Class 4 transmitter, a Class 4 receiver, or Class 4 utilization equipment. (CMP-3)

Class 4 Power System.

An actively monitored and controlled system consisting of one or more Class 4 transmitters and one or more Class 4 receivers connected by a cabling system. (CMP-3)

Class 4 Receiver.

A device that accepts Class 4 power and converts it for use by utilization equipment. (CMP-3)

Class 4 Transmitter.

A device that sources Class 4 power, monitors the line for faults, ceases power transmission if a fault is sensed, and limits the energy and power into a fault to the levels described in 726.121(A). (CMP-3)

Class 4 Tray Cable (CL4TC).

A factory assembly of two or more insulated conductors rated to at least 450 volts dc, with or without associated bare or insulated equipment grounding conductors, under a nonmetallic jacket. (CMP-3)

Class 4 Utilization Equipment.

Devices that are directly powered by a Class 4 transmitter without the need for a separate Class 4 receiver (the receiver is integrated into the equipment). (CMP-3)

Closed Construction.

Any building, building component, assembly, or system manufactured in such a manner that all concealed parts of processes of manufacture cannot be inspected after installation at the building site without disassembly, damage, or destruction. (545) (CMP-7)

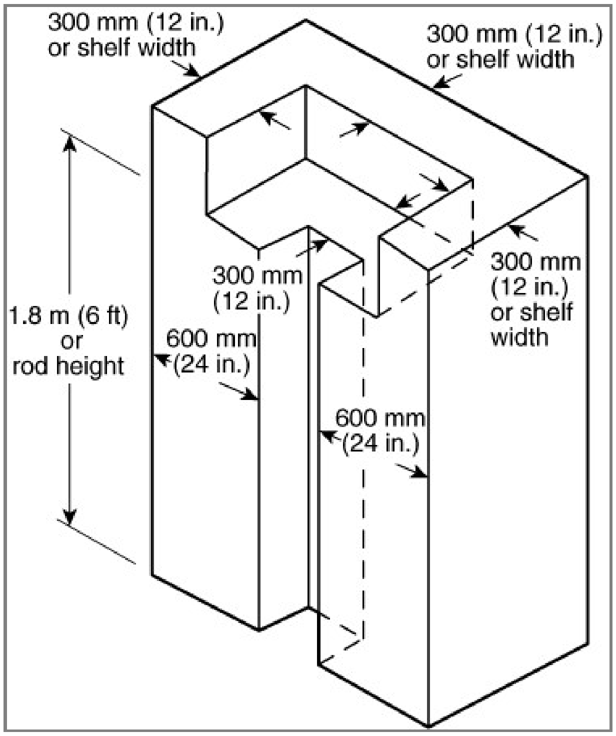
Clothes Closet.

A nonhabitable room or space intended primarily for storage of garments and apparel. (CMP-1)

Clothes Closet Storage Space.

The volume bounded by the sides and back closet walls and planes extending from the closet floor vertically to a height of 1.8 m (6 ft) or to the highest clothes-hanging rod and parallel to the walls at a horizontal distance of 600 mm (24 in.) from the sides and back of the closet walls, respectively, and continuing vertically to the closet ceiling parallel to the walls at a horizontal distance of 300 mm (12 in.) or the width of the shelf, whichever is greater; for a closet that permits access to both sides of a hanging rod, this space includes the volume below the highest rod extending 300 mm (12 in.) on either side of the rod on a plane horizontal to the floor extending the entire length of the rod. (410) (CMP-18)

Figure Figure Informational Note Figure 100.1 Clothes Closet Storage Space.



Collector Rings.

An assembly of slip rings for transferring electric energy from a stationary to a rotating member. (675) (CMP-7)

Combustible Dust.

Dust particles that are 500 microns or smaller (i.e., material passing a U.S. No. 35 Standard Sieve as defined in ASTM E11-2015, *Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves*) and present a fire or explosion hazard when dispersed and ignited in air. (CMP-14)

Informational Note: See ASTM E1226-2012a, *Standard Test Method for Explosibility of Dust Clouds* , or ISO 6184-1-1985, *Explosion protection systems — Part 1: Determination of explosion indices of combustible dusts in air* , for procedures for determining the explosibility of dusts.

Combustible Gas Detection System.

A protection technique utilizing stationary gas detectors in industrial establishments. (CMP-14)

Commissioning.

The process, procedures, and testing used to set up and verify the initial performance, operational controls, safety systems, and sequence of operation of electrical devices and equipment, prior to it being placed into active service. (CMP-13)

Communications Circuit.

A metallic, fiber, or wireless circuit that provides voice/data (and associated power) for communications-related services between communications equipment. (CMP-16)

Communications Circuit, Network-Powered Broadband. (Network-Powered Broadband Communications Circuit)

The circuit extending from the communications utility's or service provider's serving terminal or tap up to and including the NIU. (830) (CMP-16)

Informational Note: A typical one-family dwelling network-powered communications circuit consists of a communications drop or communications service cable and an NIU and includes the communications utility's serving terminal or tap where it is not under the exclusive control of the communications utility.

Communications Circuit, Premises. (Premises Communications Circuit)

The circuit that extends voice, audio, video, data, interactive services, telegraph (except radio), and outside wiring for fire alarm and burglar alarm from the service provider's network terminal to the customer's communications equipment. (840) (CMP-16)

Communications Equipment.

The electronic equipment that performs the telecommunications operations for the transmission of audio, video, and data, and includes power equipment (e.g., dc converters, inverters, and batteries), technical support equipment (e.g., computers), and conductors dedicated solely to the operation of the equipment. (CMP-16)

Informational Note: As the telecommunications network transitions to a more data-centric network, computers, routers, servers, and their powering equipment, are becoming essential to the transmission of audio, video, and data and are finding increasing application in communications equipment installations.

Communications Service Provider.

An organization, business, or individual that offers communications service to others. (CMP-16)

Compact (as applied to conductor stranding).

A conductor where each layer of strands is pressed together to the extent that almost all the gaps between the strands are eliminated so that the overall diameter of the finished conductor is less than a concentric stranded conductor and less than a compressed stranded conductor. (CMP-6)

Compressed (as applied to conductor stranding).

A conductor where the outer layer of strands is pressed together so that the overall diameter of the finished conductor is less than a concentric stranded conductor but greater than a compact stranded conductor. (CMP-6)

Concealable Nonmetallic Extension.

A listed assembly of two, three, or four insulated circuit conductors within a nonmetallic jacket, an extruded thermoplastic covering, or a sealed nonmetallic covering. The classification includes surface extensions intended for mounting directly on the surface of walls or ceilings and concealed with paint, texture, joint compound, plaster, wallpaper, tile, wall paneling, or other similar materials. (CMP-6)

Concealed.

Rendered inaccessible by the structure or finish of the building. (CMP-1)

Informational Note: Wires in concealed raceways are considered concealed, even though they may become accessible by withdrawing them.

Concealed Knob-and-Tube Wiring.

A wiring method using knobs, tubes, and flexible nonmetallic tubing for the protection and support of single insulated conductors. (CMP-6)

Concentric (as applied to conductor stranding).

A conductor consisting of a straight central strand surrounded by one or more layers of strands, helically laid in a geometric pattern. (CMP-6)

Conductor, Bare.

A conductor having no covering or electrical insulation whatsoever. (CMP-6)

Conductor, Covered.

A conductor encased within material of composition or thickness that is not recognized by this *Code* as electrical insulation. (CMP-6)

Conductor, Insulated.

A conductor encased within material of composition and thickness that is recognized by this *Code* as electrical insulation. (CMP-6)

Conductor, Insulated (as applied to messenger-supported wiring).

Overhead service conductor encased in a polymeric material that has been evaluated for the applied nominal voltage and any conductor types described in 310.4. (396) (CMP-6)

Informational Note: See ICEA S-76-474-2011, *Standard for Neutral Supported Power Cable Assemblies with Weather-Resistant Extruded Insulation Rated 600 Volts*, for evidence of evaluation of overhead service conductors.

Conduit, Flexible Metal (FMC). (Flexible Metal Conduit)

A raceway of circular cross section made of helically wound, formed, interlocked metal strip. (CMP-8)

Conduit, High Density Polyethylene (HDPE). (High Density Polyethylene Conduit)

A nonmetallic raceway of circular cross section, with associated couplings, connectors, and fittings for the installation of electrical conductors. (CMP-8)

Conduit, Intermediate Metal (IMC). (Intermediate Metal Conduit)

A steel threadable raceway of circular cross section designed for the physical protection and routing of conductors and cables and for use as an equipment grounding conductor when installed with its integral or associated coupling and appropriate fittings. (CMP-8)

Conduit, Liquidtight Flexible Metal (LFMC). (Liquidtight Flexible Metal Conduit)

A raceway of circular cross section having an outer liquidtight, nonmetallic, sunlight-resistant jacket over an inner flexible metal core with associated couplings, connectors, and fittings for the installation of electric conductors. (CMP-8)

Conduit, Liquidtight Flexible Nonmetallic (LFNC). (Liquidtight Flexible Nonmetallic Conduit)

A raceway of circular cross section of various types as follows:

(1) A smooth seamless inner core and cover bonded together and having one or more reinforcement layers between the core and covers, designated as Type LFNC-A

(2) A smooth inner surface with integral reinforcement within the raceway wall, designated as Type LFNC-B

(3) A corrugated internal and external surface without integral reinforcement within the raceway wall, designated as Type LFNC-C

(CMP-8)

Informational Note: FNMC is an alternative designation for LFNC.

Conduit, Nonmetallic Underground with Conductors (NUCC). (Nonmetallic Underground Conduit with Conductors)

A factory assembly of conductors or cables inside a nonmetallic, smooth wall raceway with a circular cross section. (CMP-8)

Conduit, Reinforced Thermosetting Resin (RTRC). (Reinforced Thermosetting Resin Conduit)

A rigid nonmetallic raceway of circular cross section, with integral or associated couplings, connectors, and fittings for the installation of electrical conductors and cables. (CMP-8)

Conduit, Rigid Metal (RMC). (Rigid Metal Conduit)

A threadable raceway of circular cross section designed for the physical protection and routing of conductors and cables and for use as an equipment grounding conductor when installed with its integral or associated coupling and appropriate fittings. (CMP -8)

Conduit, Rigid Polyvinyl Chloride (PVC). (Rigid Polyvinyl Chloride Conduit)

A rigid nonmetallic raceway of circular cross section, with integral or associated couplings, connectors, and fittings for the installation of electrical conductors and cables. (CMP-8)

Conduit Body.

A separate portion of a conduit or tubing system that provides access through a removable cover(s) to the interior of the system at a junction of two or more sections of the system or at a terminal point of the system.

Boxes such as FS and FD or larger cast or sheet metal boxes are not classified as conduit bodies. (CMP-9)

Connector.

A term used to refer to an electromechanical fitting. (393) (CMP-18)

Connector, Intercell. (Intercell Connector)

An electrically conductive bar or cable used to connect adjacent cells. (CMP-13)

Connector, Intertier. (Intertier Connector)

An electrical conductor used to connect two cells on different tiers of the same rack or different shelves of the same rack. (CMP-13)

Connector, Load

An electromechanical connector used for power from the busbar to utilization equipment. (393) (CMP-18)

Connector, Pendant.

An electromechanical or mechanical connector used to suspend low-voltage luminaire or utilization equipment below the grid rail and to supply power to connect from the busbar to utilization equipment. (393) (CMP-18)

Connector, Power Feed.

An electromechanical connector used to connect the power supply to a power distribution cable, to connect directly to the busbar, or to connect from a power distribution cable to the busbar. (393) (CMP-18)

Connector, Pressure (Solderless).

A device that establishes a connection between two or more conductors or between one or more conductors and a terminal by means of mechanical pressure and without the use of solder. (CMP-1)

Connector, Rail to Rail.

An electromechanical connector used to interconnect busbars from one ceiling grid rail to another grid rail. (393) (CMP-18)

Connector Strip.

A metal wireway containing pendant or flush receptacles. (520) (CMP-15)

Container (as applied to batteries).

A single-cell or multicell vessel or jar that holds the plates, electrolyte, and other elements of a single unit in a battery. (CMP-13)

Continuous Load.

A load where the maximum current is expected to continue for 3 hours or more. (CMP-2)

Control.

The predetermined process of connecting, disconnecting, increasing, or reducing electric power. (750) (CMP-13)

Control Circuit.

The circuit of a control apparatus or system that carries the electric signals directing the performance of the controller but does not carry the main power current. (CMP-11)

Control Circuits, Fault-Tolerant External. (Fault-Tolerant External Control Circuits)

Those control circuits either entering or leaving the fire pump controller enclosure, which if broken, disconnected, or shorted will not prevent the controller from starting the fire pump from all other internal or external means and may cause the controller to start the pump under these conditions. (695) (CMP-13)

Control Device, Emergency Lighting.

A separate or integral device intended to perform one or more emergency lighting control functions. (700) (CMP-13)

Informational Note: See UL 924, *Emergency Lighting and Power Equipment* , for information covering emergency lighting control devices.

Control Drawing.

A drawing or other document provided by the manufacturer of the intrinsically safe or associated apparatus, or of the nonincendive field wiring apparatus or associated nonincendive field wiring apparatus, that details the allowed interconnections between the intrinsically safe and associated apparatus or between the nonincendive field wiring apparatus or associated nonincendive field wiring apparatus. (CMP-14)

Control Room (as applied to elevator, dumbwaiter).

An enclosed control space outside the hoistway, intended for full bodily entry, that contains the elevator motor controller. The room could also contain electrical and/or mechanical equipment used directly in connection with the elevator or dumbwaiter but not the electric driving machine or the hydraulic machine. (620) (CMP-12)

Control Space (as applied to elevator, dumbwaiter).

A space inside or outside the hoistway, other than a hoistway intended to be accessed with or without full bodily entry, that contains the elevator motor controller. This space could also contain electrical and/or mechanical equipment used directly in connection with the elevator,dumbwaiter, escalator, moving walk, or platform lift, but not the electrical driving machine or the hydraulic machine. (620) (CMP-12)

Control System.

The overall system governing the starting, stopping, direction of motion, acceleration, speed, and retardation of the moving member. (620) (CMP-12)

Controller.

A device or group of devices that serves to govern, in some predetermined manner, the electric power delivered to the apparatus to which it is connected. (CMP-1)

Controller, Motion. (Motion Controller)

The electrical device(s) for that part of the control system that governs the acceleration, speed, retardation, and stopping of the moving member. (620) (CMP-12)

Controller, Motor. (Motor Controller)

The operative units of the control system comprising the starter device(s) and power conversion equipment used to drive an electric motor or the pumping unit used to power hydraulic control equipment. (620) (CMP-12)

Controller, Motor. (Motor Controller)

Any switch or device that is normally used to start and stop a motor by making and breaking the motor circuit current. (CMP-11)

Controller, Operation. (Operation Controller)

The electrical device(s) for that part of the control system that initiates the starting, stopping, and direction of motion in response to a signal from an operating device. (620) (CMP-12)

Converter.

A device that changes electrical energy from one form to another, as from alternating current to direct current. (551) (CMP-7)

Converting Device.

That part of the heating equipment that converts input mechanical or electrical energy to the voltage, current, and frequency used for the heating applicator. A converting device consists of equipment using line frequency, all static multipliers, oscillator-type units using vacuum tubes, inverters using solid-state devices, or motor-generator equipment. (665) (CMP-12)

Cooking Unit, Counter-Mounted.

A cooking appliance designed for mounting in or on a counter and consisting of one or more heating elements, internal wiring, and built-in or mountable controls. (CMP-2)

Coordination, Selective. (Selective Coordination)

Localization of an overcurrent condition to restrict outages to the circuit or equipment affected, accomplished by the selection and installation of overcurrent protective devices and their ratings or settings for the full range of available overcurrents, from overload to the available fault current, and for the full range of overcurrent protective device opening times associated with those overcurrents. (CMP-10)

Copper-Clad Aluminum Conductors.

Conductors drawn from a copper-clad aluminum rod, with the copper metallurgically bonded to an aluminum core. (CMP-6)

Cord, Flexible. (Flexible Cord)

Two or more flexible insulated conductors enclosed in a flexible covering that provides mechanical protection. [**79:** 3.3.29] (CMP-6)

Cord Connector.

A female contact device that mates with an attachment plug or other male device. (CMP-6)

Cord Connector.

A fitting intended to terminate a cord to a box or similar device and reduce the strain at points of termination; might include an explosionproof, a dust-ignitionproof, or a flameproof seal. (CMP-14)

Cord Connector (as applied to Electrified Truck Parking Spaces).

The necessary equipment usually consisting of a circuit breaker or switch and fuses, and their accessories, located near the point of entrance of supply conductors in an electrified truck parking space and intended to constitute the means of cutoff for the supply to that truck. (626) (CMP-12)

Cord Set.

A length of flexible cord having an attachment plug at one end and a cord connector at the other end. (CMP-6)

Corrosive Environment — Swimming Pools, Fountains, and Similar Installations.

Areas or enclosures without adequate ventilation, where electrical equipment is located and pool sanitation chemicals are stored, handled, or dispensed . (680) (CMP-17).

Informational Note No. 1: See *Advisory: Swimming Pool Chemical: Chlorine* , OSWER 90-008.1, June 1990, available from the EPA National Service Center for Environmental Publications (NSCEP) as sanitation chemicals and pool water are considered to pose a risk of corrosion (gradual damage or destruction of materials) due to the presence of oxidizers (e.g., calcium hypochlorite, sodium hypochlorite, bromine, chlorinated isocyanurates) and chlorinating agents that release chlorine when dissolved in water.

Informational Note No. 2: See ANSI/APSP-11, *Standard for Water Quality in Public Pools and Spas* , ANSI/ASHRAE 62.1, Table 6-4 Minimum Exhaust Rates, and Section 324 of the *2021 International Swimming Pool and Spa Code (ISPSC)* , including associated definitions and requirements concerning adequate ventilation of indoor spaces such as equipment and chemical storage rooms, which can reduce the likelihood of the accumulation of corrosive vapors. Chemicals such as chlorine cause severe corrosive and deteriorating effects on electrical connections, equipment, and enclosures when stored and kept in the same vicinity.

Crane.

A mechanical device used for lifting or moving boats. [**303:** 3.3.5] (555) (CMP-7)

Critical Branch.

A system of feeders and branch circuits supplying power for task illumination, fixed equipment, select receptacles, and select power circuits serving areas and functions related to patient care that are automatically connected to alternate power sources by one or more transfer switches during interruption of the normal power source. [**99:** 3.3.30] (517) (CMP-15)

Critical Operations Areas, Designated (DCOA). (Designated Critical Operations Areas)

Areas within a facility or site designated as requiring critical operations power. (CMP-13)

Critical Operations Data System.

An information technology equipment system that requires continuous operation for reasons of public safety, emergency management, national security, or business continuity. (645) (CMP-12)

Critical Operations Power Systems (COPS).

Power systems for facilities or parts of facilities that require continuous operation for the reasons of public safety, emergency management, national security, or business continuity. (CMP-13)

Cutout Box.

An enclosure designed for surface mounting that has swinging doors or covers secured directly to and telescoping with the walls of the enclosure. (CMP-9)

Data Center, Modular (MDC). (Modular Data Center)

Prefabricated units, rated 1000 volts or less, consisting of an outer enclosure housing multiple racks or cabinets of information technology equipment (ITE) (e.g., servers) and various support equipment, such as electrical service and distribution equipment, HVAC systems, and the like. (646) (CMP-12)

Informational Note: A typical construction may use a standard ISO shipping container or other structure as the outer enclosure, racks or cabinets of ITE, service-entrance equipment and power distribution components, power storage such as a UPS, and an air or liquid cooling system. Modular data centers are intended for fixed installation, either indoors or outdoors, based on their construction and resistance to environmental conditions. MDCs can be configured as an all-in-one system housed in a single equipment enclosure or as a system with the support equipment housed in separate equipment enclosures.

DC-to-DC Converter.

A device that can provide an output dc voltage and current at a higher or lower value than the input dc voltage and current. (CMP-4)

DC-to-DC Converter Circuit.

The dc circuit conductors connected to the output of a dc-to-dc converter. (CMP-4)

DC System, Reference-Grounded. (Reference-Grounded DC System)

A system that is not solidly grounded but has a low-resistance electrical reference that maintains voltage to ground in normal operation. (712) (CMP-13)

DC System, Three-Wire, Grounded. (Grounded Three-Wire DC System)

A system with a solid connection or reference-ground between the center point of a bipolar dc power source and the equipment grounding system. (712) (CMP-13)

DC System, Two-Wire, Grounded. (Grounded Two-Wire DC System)

A system that has a solid connection or reference-ground between one of the current-carrying conductors and the equipment grounding system. (712) (CMP-13)

DC System, Ungrounded. (Ungrounded DC System)

A system that has no direct or resistive connection between the current-carrying conductors and the equipment grounding system. (712) (CMP-13)

Dead Front.

Without live parts exposed to a person on the operating side of the equipment. (CMP-9)

Dead Front (as applied to switches, circuit breakers, switchboards, and panelboards).

Designed, constructed, and installed so that no current-carrying parts are normally exposed on the front. (551) (CMP-7)

Demand Factor.

The ratio of the maximum demand of a system, or part of a system, to the total connected load of a system or the part of the system under consideration. (CMP-2)

Dental Office.

A building or part thereof in which the following occur:

(1) Examinations and minor treatments/procedures performed under the continuous supervision of a dental professional;

(2) Use of limited to minimal sedation and treatment or procedures that do not render the patient incapable of self-preservation under emergency conditions; and

(3) No overnight stays for patients or 24-hour operations.

[**99:** 3.3.38] (CMP-15)

Device.

A unit of an electrical system, other than a conductor, that carries or controls electric energy as its principal function. (CMP-1)

Dielectric Heating.

Heating of a nominally insulating material due to its own dielectric losses when the material is placed in a varying electric field. (665) (CMP-12)

Different Intrinsically Safe Circuits.

Intrinsically safe circuits in which the possible interconnections have not been evaluated and identified as intrinsically safe. (504) (CMP-14)

Direct-Current (dc) Combiner.

An enclosure that includes devices used to connect two or more PV system dc circuits in parallel. (690) (CMP-4)

Disconnecting Means.

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)

Disconnecting Means, Parking Space. (Parking Space Disconnecting Means)

The necessary equipment usually consisting of a circuit breaker or switch and fuses, and their accessories, located near the point of entrance of supply conductors in an electrified truck parking space and intended to constitute the means of cutoff for the supply to that truck. (626) (CMP-12)

Disconnecting Means, Recreational Vehicle. (Recreational Vehicle Disconnecting Means)

The necessary equipment usually consisting of a circuit breaker or switch and fuses, and their accessories, located near the point of entrance of supply conductors in a recreational vehicle and intended to constitute the means of cutoff for the supply to that recreational vehicle. (551) (CMP-7)

Distribution Point.

An electrical supply point from which service drops, service conductors, feeders, or branch circuits to buildings or structures utilized under single management are supplied. (547) (CMP-7)

Informational Note No. 1: Distribution points are also known as the center yard pole, meter pole, or the common distribution point.

Informational Note No. 2: The service point as defined in Article 100 is typically at the distribution point.

Diversion Charge Controller.

Equipment that regulates the charging process of an ESS by diverting power from energy storage to direct-current or alternating-current loads or to an interconnected utility service. (706) (CMP-13)

Diversion Charge Controller.

Equipment that regulates the charging process of a battery or other energy storage device by diverting power from energy storage to dc or ac loads, or to an interconnected utility service. (CMP-4)

Diversion Load.

A load connected to a diversion charge controller or diversion load controller, also known as a dump load. (CMP-4)

Diversion Load Controller.

Equipment that regulates the output of a wind generator by diverting power from the generator to dc or ac loads or to an interconnected utility service. (CMP-4)

Docking Facility.

A covered or open, fixed or floating structure that provides access to the water and to which boats are secured. [**303:** 3.3.6] (555) (CMP-7)

Dormitory Unit.

A building or a space in a building in which 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, under joint occupancy and single management, with or without meals, but without individual cooking facilities. (CMP 2)

Drop Box.

A box containing pendant- or flush-mounted receptacles attached to a multiconductor cable via strain relief or a multipole connector. (520) (CMP-15)

Drilling Rig Cable, Type P.

A factory assembly of one or more insulated flexible tinned copper conductors, with associated equipment grounding conductor(s), with or without a braided metallic armor and with an overall nonmetallic jacket. (CMP-6)

Dust-Ignitionproof.

Equipment enclosed in a manner that excludes dusts and does not permit arcs, sparks, or heat otherwise generated or liberated inside of the enclosure to cause ignition of exterior accumulations or atmospheric suspensions of a specified dust on or in the vicinity of the enclosure. (CMP-14)

> Informational Note No. 1: See ANSI/UL 1203-2015, *Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations* , for additional information on dust-ignitionproof enclosures.

> Informational Note No. 2: Dust-ignitionproof enclosures are sometimes additionally marked Type 9 in accordance with NEMA 250-2014, *Enclosures for Electrical Equipment (1000 Volts Minimum)* .

Dusttight.

Enclosures constructed so that dust will not enter under specified test conditions. (CMP-14)

> Informational Note No. 1: See ANSI/UL 121201-2017, *Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations* , for additional information.

> Informational Note No. 2: Enclosure Types 3, 3X, 3S, 3SX, 4, 4X, 5, 6, 6P, 12, 12K, and 13, in accordance with NEMA 250-2014, *Enclosures for Electrical Equipment (1000 Volts Minimum),* and ANSI/UL 50E-2015, *Enclosures for Electrical Equipment, Environmental Considerations* , are considered dusttight.

Duty, Continuous.

Operation at a substantially constant load for an indefinitely long time. (CMP-1)

Duty, Intermittent.

Operation for alternate intervals of (1) load and no load; or (2) load and rest; or (3) load, no load, and rest. (CMP-1)

Duty, Periodic.

Intermittent operation in which the load conditions are regularly recurrent. (CMP-1)

Duty, Short-Time.

Operation at a substantially constant load for a short and definite, specified time. (CMP-1)

Duty, Varying.

Operation at loads, and for intervals of time, both of which may be subject to wide variation. (CMP-1)

Dwelling, Multifamily.

A building that contains three or more dwelling units. (CMP-1)

Dwelling, One-Family.

A building that consists solely of one dwelling unit. (CMP-1)

Dwelling, Two-Family.

A building that consists solely of two dwelling units. (CMP-1)

Dwelling Unit.

A single unit, providing complete and independent living facilities for one or more persons, including permanent provisions for living, sleeping, cooking, and sanitation. (CMP-2)

Electric-Discharge Lighting.

Systems of illumination utilizing fluorescent lamps, high-intensity discharge (HID) lamps, or neon tubing. (CMP-18)

Electric Power Production and Distribution Network.

Power production, distribution, and utilization equipment and facilities, such as electric utility systems that are connected to premises wiring and are external to and not controlled by a system that operates in interactive mode. (CMP-13)

Electric Sign.

A fixed, stationary, or portable self-contained, electrically operated and/or electrically illuminated utilization equipment with words or symbols designed to convey information or attract attention. (CMP-18)

Electric Supply Stations.

Locations containing the generating stations and substations, including their associated generator, storage battery, transformer, and switchgear areas. (CMP-4)

Electric Vehicle (EV).

An automotive-type vehicle for on-road use, such as passenger automobiles, buses, trucks, vans, neighborhood electric vehicles, and electric motorcycles, primarily powered by an electric motor that draws current from a rechargeable storage battery, fuel cell, photovoltaic array, or other source of electric current. Plug-in hybrid electric vehicles (PHEV) are electric vehicles having a second source of motive power. (CMP-12)

> Informational Note: Off-road, self-propelled electric mobile machines, such as industrial trucks, hoists, lifts, transports, golf carts, airline ground support equipment, tractors, and boats are not considered electric vehicles.

Electric Vehicle Connector.

A device that, when electrically coupled (conductive or inductive) to an electric vehicle inlet, establishes an electrical connection to the electric vehicle for the purpose of power transfer and information exchange. (625) (CMP-12)

> Informational Note: See 625.48 for further information on interactive systems.

Electric Vehicle Power Export Equipment (EVPE).

The equipment, including the outlet on the vehicle, that is used to provide electrical power at voltages greater than or equal to 30 Vac or 60 Vdc to loads external to the vehicle, using the vehicle as the source of supply. (625) (CMP-12)

> Informational Note: Electric vehicle power export equipment and electric vehicle supply equipment or wireless power transfer equipment are sometimes contained in one piece of equipment, sometimes referred to as a bidirectional EVSE or bidirectional WPTE.

Electric Vehicle Supply Equipment (EVSE).

Equipment for plug-in charging comprising the conductors, including the ungrounded, grounded, and equipment grounding conductors, and the electric vehicle connectors, attachment plugs, personnel protection system, and all other fittings, devices, power outlets, or apparatus installed specifically for the purpose of transferring energy between the premises wiring and the electric vehicle. (625) (CMP-12)

> Informational Note: Electric vehicle power export equipment and electric vehicle supply equipment or wireless power transfer equipment are sometimes contained in one piece of equipment, sometimes referred to as a bidirectional EVSE or bidirectional WPTE.

Electrical Circuit Protective System.

A system consisting of components and materials intended for installation as protection for specific electrical wiring systems with respect to the disruption of electrical circuit integrity upon exterior fire exposure. (CMP-16)

Electrical Datum Plane.

A specified distance above a water level above which electrical equipment can be installed and electrical connections can be made. (CMP-7)

Electrical Datum Plane.

A specified distance above the normal highwater level which electrical equipment can be installed and electrical connections can be made. (CMP-7)

Electrical Ducts.

Electrical conduits, or other raceways round in cross section, that are suitable for use underground or embedded in concrete. (CMP-6)

Electrical Life Support Equipment.

Electrically powered equipment whose continuous operation is necessary to maintain a patient's life. [**99** :3.3.45] (517) (CMP-15)

Electrical Resistance Trace Heating "60079-30-1".

Type of protection for the purpose of producing heat on the principle of electrical resistance and typically composed of one or more metallic conductors and/or an electrically conductive material, suitably electrically insulated and protected. (506) (CMP-14)

> Informational Note: See ANSI/UL 60079-30-1-2017, *Explosive Atmospheres — Part 30-1: Electrical Resistance Trace Heating — General and Testing Requirements* .

Electrically Connected.

A connection capable of carrying current as distinguished from connection through electromagnetic induction. (668) (CMP-12)

Electrically Powered Pool Lift.

An electrically powered lift that provides accessibility to and from a pool or spa for people with disabilities. (680) (CMP-17)

Electrified Truck Parking Space.

A truck parking space that has been provided with an electrical system that allows truck operators to connect their vehicles while stopped and to use off-board power sources in order to operate on-board systems such as air conditioning, heating, and appliances, without any engine idling. (626) (CMP-12)

> Informational Note: An electrified truck parking space also includes dedicated parking areas for heavy-duty trucks at travel plazas, warehouses, shipper and consignee yards, depot facilities, and border crossings. It does not include areas such as the shoulders of highway ramps and access roads, camping and recreational vehicle sites, residential and commercial parking areas used for automotive parking or other areas where ac power is provided solely for the purpose of connecting automotive and other light electrical loads, such as engine block heaters, and at private residences.

Electrified Truck Parking Space Wiring Systems.

All of the electrical wiring, equipment, and appurtenances related to electrical installations within an electrified truck parking space, including the electrified parking space supply equipment. (626) (CMP-12)

Electronic Power Converter.

A device that uses power electronics to convert one form of electrical power into another form of electrical power. (CMP-4)

> Informational Note: Examples of electronic power converters include, but are not limited to, inverters, dc-to-dc converters, and electronic charge controllers. These devices have limited current capabilities based on the device ratings at continuous rated power.

Electronically Protected (as applied to motors).

A motor provided with electronic control that is an integral part of the motor and protects the motor against dangerous overheating due to failure of the electronic control, overload, and failure to start. (CMP-11)

Electrolyte.

The medium that provides the ion transport mechanism between the positive and negative electrodes of a cell. (CMP-13)

Electrolytic Cell.

A tank or vat in which electrochemical reactions are caused by applying electric energy for the purpose of refining or producing usable materials. (668) (CMP-12)

Electrolytic Cell Line Working Zone.

The space envelope wherein operation or maintenance is normally performed on or in the vicinity of exposed energized surfaces of electrolytic cell lines or their attachments. (668) (CMP-12)

Emergency Luminaire, Battery-Equipped (Battery-Equipped Emergency Luminaire).

A luminaire with a rechargeable battery, a battery charging means, and an automatic load control relay. (700) (701) (CMP-13)

Emergency Power Supply (EPS).

The source(s) of electric power of the required capacity and quality for an emergency power supply system (EPSS). (CMP-13)

Emergency Power Supply System (EPSS).

This definition shall apply within this article and throughout the code. A complete functioning EPS system coupled to a system of conductors, disconnecting means and overcurrent protective devices, transfer switches, and all control, supervisory, and support devices up to and including the load terminals of the transfer equipment needed for the system to operate as a safe and reliable source of electric power. [**110:** 3.3.4] (CMP-13)

Emergency Systems.

Those systems legally required and classed as emergency by municipal, state, federal, or other codes, or by any governmental agency having jurisdiction. These systems are intended to automatically supply illumination, power, or both, to designated areas and equipment in the event of failure of the normal supply or in the event of accident to elements of a system intended to supply, distribute, and control power and illumination essential for safety to human life. (CMP-13)

Encapsulation “m”.

Type of protection where electrical parts that could ignite an explosive atmosphere by either sparking or heating are enclosed in a compound in such a way that this explosive atmosphere cannot be ignited. (CMP-14)

> Informational Note: See ANSI/UL 60079-18-2015, *Explosive atmospheres — Part 18: Equipment protection by encapsulation “m”*.

Enclosed.

Surrounded by a case, housing, fence, or wall(s) that prevents persons from accidentally contacting energized parts. (CMP-1)

Enclosed-Break.

Having electrical make-or-break contacts such that, if an internal explosion of the flammable gas or vapor that can enter it occurs, the device will withstand the internal explosion without suffering damage and without communicating the internal explosion to the external flammable gas or vapor. (500) (CMP-14)

> Informational Note: See ANSI/UL 121201-2017, *Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations* , for additional information.

Enclosure.

The case or housing of apparatus, or the fence or walls surrounding an installation to prevent personnel from accidentally contacting energized parts or to protect the equipment from physical damage. (CMP-1)

> Informational Note: See Table 110.28 for examples of enclosure types.

Energized.

Electrically connected to, or is, a source of voltage. (CMP-1)

Energy Management System.

A system consisting of any of the following: a monitor(s), communications equipment, a controller(s), a timer(s), or other device(s) that monitors and/or controls an electrical load or a power production or storage source. (CMP-13)

Energy Storage System (ESS).

One or more devices installed as a system capable of storing energy and providing electrical energy into the premises wiring system or an electric power production and distribution network. (CMP-13)

Informational Note No. 1: An ESS(s) can include but is not limited to batteries, capacitors, and kinetic energy devices (e.g., flywheels and compressed air). An ESS(s) can include inverters or converters to change voltage levels or to make a change between an ac or a dc system.

Informational Note No. 2: These systems differ from a stationary standby battery installation where a battery spends the majority of the time on continuous float charge or in a high state of charge, in readiness for a discharge event.

Entertainment Device.

A mechanical or electromechanical device that provides an entertainment experience. (522) (CMP-15)

Informational Note: These devices can include animated props, show action equipment, animated figures, and special effects, coordinated with audio and lighting to provide an entertainment experience.

Equipment.

A general term, including fittings, devices, appliances, luminaires, apparatus, machinery, and the like used as a part of, or in connection with, an electrical installation. (CMP-1)

Equipment, Portable (as applied to audio equipment). (Portable Equipment)

Equipment fed with portable cords or cables intended to be moved from one place to another. (640) (CMP-12)

Equipment, Signal. (Signal Equipment)

Includes audible and visual equipment such as chimes, gongs, lights, and displays that convey information to the user. (620) (CMP-12)

Equipment Branch.

A system of feeders and branch circuits arranged for delayed, automatic, or manual connection to the alternate power source and that serves primarily 3-phase power equipment. [**99** :3.3.50] (517) (CMP-15)

Equipment Protection Level (EPL).

Level of protection assigned to equipment based on its likelihood of becoming a source of ignition, and distinguishing the differences between explosive gas atmospheres and explosive dust atmospheres. (CMP-14)

Equipment Rack.

A framework for the support, enclosure, or both, of equipment; can be portable or stationary. (640) (CMP-12)

Informational Note: See EIA/ECA 310-E-2005, *Cabinets, Racks, Panels and Associated Equipment* , for examples of equipment racks.

Equipotential Plane.

Conductive parts bonded together to reduce voltage gradients in a designated area. (682) (CMP-17)

Equipotential Plane (as applied to agricultural buildings).

An area where wire mesh or other conductive elements are embedded in or placed under concrete, bonded to all metal structures and fixed nonelectrical equipment that could become energized, and connected to the electrical grounding system to minimize voltage differences within the plane and between the planes, the grounded equipment, and the earth. (547) (CMP-7)

Essential Electrical System.

A system comprised of alternate power sources and all connected distribution systems and ancillary equipment, designed to ensure continuity of electrical power to designated areas and functions of a health care facility during disruption of normal power sources, and also to minimize disruption within the internal wiring system. [**99** :3.3.52] (517) (CMP-15)

Explosionproof Equipment.

Equipment enclosed in a case that is capable of withstanding an explosion of a specified gas or vapor that might occur within it, that is capable of preventing the ignition of a specified gas or vapor surrounding the enclosure by sparks, flashes, or explosion of the gas or vapor within, and that operates at such an external temperature that a surrounding flammable atmosphere will not be ignited. (CMP-14)

Informational Note No. 1: See ANSI/UL 1203-2015, *Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations* , for additional information.

Informational Note No. 2: Explosionproof enclosures are sometimes additionally marked Type 7 in accordance with NEMA 250-2014, *Enclosures for Electrical Equipment (1000 Volts Minimum)* .

Exposed (as applied to live parts).

Capable of being inadvertently touched or approached nearer than a safe distance by a person. (CMP-1)

Informational Note: This term applies to parts that are not suitably guarded, isolated, or insulated.

Exposed (as applied to wiring methods).

On or attached to the surface or behind panels designed to allow access. (CMP-1)

Exposed (Optical Fiber Cable Exposed to Accidental Contact).

A conductive optical fiber cable in such a position that, in case of failure of supports or insulation, contact between the cable's non–current-carrying conductive members and an electrical circuit might result. (CMP-16)

Exposed (to Accidental Contact).

A circuit in such a position that, in case of failure of supports or insulation, contact with another circuit may result. (CMP-16)

> Informational Note: See Part I of Article 100 for two other definitions of Exposed: *Exposed (as applied to live parts) and Exposed (as applied to wiring methods).*

Exposed Conductive Surfaces.

Those surfaces that are capable of carrying electric current and that are unprotected, uninsulated, unenclosed, or unguarded, permitting personal contact. [**99:** 3.3.54] (517) (CMP-15)

> Informational Note: Paint, anodizing, and similar coatings are not considered suitable insulation, unless they are listed for such use.

Externally Operable.

Capable of being operated without exposing the operator to contact with live parts. (CMP-1)

Facility, On-Site Power Production. (On-Site Power Production Facility)

The normal supply of electric power for the site that is expected to be constantly producing power. (695) (CMP-13)

Fastened-in-Place.

Mounting means of equipment in which the fastening means are specifically designed to permit removal without the use of a tool. (625) (CMP-12)

Fault-Managed Power (FMP).

A powering system that monitors for faults and controls power delivered to ensure fault energy is limited. The monitoring and control systems differentiate them from electric light and power circuits; therefore, alternative requirements to those of Chapters 1 through 4 are given regarding minimum wire sizes, ampacity adjustment and correction factors, overcurrent protection, insulation requirements, and wiring methods and materials. (CMP-3)

Fault Current.

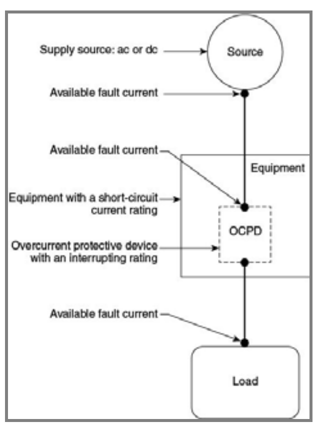
The current delivered at a point on the system during a short-circuit condition. (CMP-10)

Fault Current, Available. (Available Fault Current)

The largest amount of current capable of being delivered at a point on the system during a short-circuit condition. (CMP-10)

> Informational Note: A short-circuit can occur during abnormal conditions such as a fault between circuit conductors or a ground fault. See Informational Note Figure 100.2 .

Figure Informational Note Figure 100.2 Available Fault Current.



Fault Hazard Current.

See *Hazard Current* .

Fault Protection Device.

An electronic device that is intended for the protection of personnel and functions under fault conditions, such as network-powered broadband communications cable short or open circuit, to limit the current or voltage, or both, for a low-power network-powered broadband communications circuit and provide acceptable protection from electric shock. (830) (CMP-16)

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 device. (CMP-10)

Feeder, Recreational Vehicle Site. (Recreational Vehicle Site Feeder)

The conductors between the park service equipment and the recreational vehicle site supply equipment. (551) (CMP-7)

Feeder Assembly.

The overhead or under-chassis feeder conductors, including the equipment grounding conductor, together with the necessary fittings and equipment or a power-supply cord listed for mobile home use, identified for the delivery of energy from the source of electrical supply to the panelboard within the mobile home. (550) (CMP-7)

Festoon Lighting.

A string of outdoor lights that is suspended between two points. (CMP-18)

Field Evaluation Body (FEB).

An organization or part of an organization that performs field evaluations of electrical or other equipment. [**790,** 2018] (CMP-1)

> Informational Note: NFPA 790-2018, *Standard for Competency of Third-Party Field Evaluation Bodies* , provides guidelines for establishing the qualification and competency of a body performing field evaluations of electrical products and assembles with electrical components.

Field Labeled (as applied to evaluated products).

Equipment or materials to which has been attached a label, symbol, or other identifying mark of an FEB indicating the equipment or materials were evaluated and found to comply with requirements as described in an accompanying field evaluation report. [**790,** 2018] (CMP-1)

Fire Alarm Circuit.

The portion of the wiring system between the load side of the overcurrent device or the power-limited supply and the connected equipment of all circuits powered and controlled by the fire alarm system. Fire alarm circuits are classified as either non–power-limited or power-limited. (CMP-3)

Fire Alarm Circuit Integrity (CI) Cable.

Cable used in fire alarm systems to ensure continued operation of critical circuits during a specified time under fire conditions. (CMP-3)

Fire-Resistive Cable System.

A cable and components used to ensure survivability of critical circuits for a specified time under fire conditions. (CMP-3)

Fitting.

An accessory such as a locknut, bushing, or other part of a wiring system that is intended primarily to perform a mechanical rather than an electrical function. (CMP-1)

Fixed (as applied to equipment).

Equipment that is fastened or otherwise secured at a specific location. (680) (CMP-17)

Fixed-in-Place.

Mounting means of equipment using fasteners that require a tool for removal. (625) (CMP-12)

Flammable Anesthetics.

Gases or vapors, such as fluroxene, cyclopropane, divinyl ether, ethyl chloride, ethyl ether, and ethylene, that could form flammable or explosive mixtures with air, oxygen, or reducing gases such as nitrous oxide. (517) (CMP-15)

Flammable Anesthetizing Location.

Any area of the facility that has been designated to be used for the administration of any flammable inhalation anesthetic agents in the normal course of examination or treatment. (517) (CMP-15)

Flameproof "d".

Type of protection where the enclosure will withstand an internal explosion of a flammable mixture that has penetrated into the interior, without suffering damage and without causing ignition, through any joints or structural openings in the enclosure of an external explosive gas atmosphere consisting of one or more of the gases or vapors for which it is designed. (505) (CMP-14)

> Informational Note: See ANSI/UL 60079-1-2015, *Explosive Atmospheres — Part 1: Equipment Protection by Flameproof Enclosures "d".*

Flat Cable Assembly, Type FC.

An assembly of parallel conductors formed integrally with an insulating material web specifically designed for field installation in surface metal raceway. (CMP-6)

Flat Conductor Cable System.

A complete wiring system for branch circuits that is designed for installation under carpet squares. (324) (CMP-6)

> Informational Note: The FCC system includes Type FCC cable and associated shielding, connectors, terminators, adapters, boxes, and receptacles.

Flat Conductor Cable, Type FCC Cable.

Three or more flat copper conductors placed edge-to-edge and separated and enclosed within an insulating assembly.

Flywheel ESS (FESS).

A mechanical ESS composed of a spinning mass referred to as a rotor and an energy conversion mechanism such as a motor-generator that converts the mechanical energy to electrical energy. (706) (CMP-13)

> Informational Note: There are primarily two types of rotor constructions, solid metal mass design and composite fiber design.

Footlight.

A border light installed on or in the stage. (520) (CMP-15)

Forming Shell.

A structure designed to support a wet-niche luminaire assembly and intended for mounting in a pool or fountain structure. (680) (CMP-17)

Fountain.

An ornamental structure or recreational water feature from which one or more jets or streams of water are discharged into the air, including splash pads, ornamental pools, display pools, and reflection pools. The definition does not include drinking water fountains or water coolers. (680) (CMP-17)

Frame (as applies to recreational vehicles).

Chassis rail and any welded addition thereto of metal thickness of 1.35 mm (0.053 in.) or greater. (551) (CMP-7)

Free Air (as applied to conductors).

Open or ventilated environment that allows for heat dissipation and air flow around an installed conductor. (CMP-6)

Fuel Cell.

An electrochemical system that consumes fuel to produce an electric current. In such cells, the main chemical reaction used for producing electric power is not combustion. However, there may be sources of combustion used within the overall cell system, such as reformers/fuel processors. (CMP-4)

Fuel Cell System.

The complete aggregate of equipment used to convert chemical fuel into usable electricity and typically consisting of a reformer, stack, power inverter, and auxiliary equipment. (CMP-4)

Fuse.

An overcurrent protective device with a circuit-opening fusible part that is heated and severed by the passage of overcurrent through it. (CMP-10)

Informational Note: A fuse comprises all the parts that form a unit capable of performing the prescribed functions. It may or may not be the complete device necessary to connect it into an electrical circuit.

Fuse, Expulsion. (Expulsion Fuse)

A vented fuse unit in which the expulsion effect of gases produced by the arc and lining of the fuseholder, either alone or aided by a spring, extinguishes the arc. (CMP-10)

Fuse, Nonvented Power. (Nonvented 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)

Fuse, Power. (Power Fuse)

A vented, nonvented, or controlled vented fuse unit in which the arc is extinguished by being drawn through solid material, granular material, or liquid, either alone or aided by a spring. (CMP-10)

Fuse, Vented Power. (Vented Power Fuse)

A fuse with provision for the escape of arc gases, liquids, or solid particles to the surrounding atmosphere during circuit interruption. (CMP-10)

Fuse, Electronically Actuated. (Electronically Actuated Fuse)

An overcurrent protective device that generally consists of a control module that provides current-sensing, electronically derived time–current characteristics, energy to initiate tripping, and an interrupting module that interrupts current when an overcurrent occurs. Such fuses may or may not operate in a current-limiting fashion, depending on the type of control selected. (CMP-10)

Garage.

A building or portion of a building in which one or more self-propelled vehicles can be kept for use, sale, storage, rental, repair, exhibition, or demonstration purposes. (CMP-1)

Informational Note: See 511.1 for commercial garages, repair and storage.

Generating Capacity, Inverter. (Inverter Generating Capacity)

The sum of parallel-connected inverter maximum continuous output power at 40°C in watts, kilowatts, volt-amperes, or kilovolt-amperes. (CMP-4)

Generating Station.

A plant wherein electric energy is produced by conversion from some other form of energy (e.g., chemical, nuclear, solar, wind, mechanical, or hydraulic) by means of suitable apparatus. (CMP-4)

Generator (Generator Set).

A machine that converts mechanical energy into electrical energy by means of a prime mover and alternator and/or inverter. (CMP-13)

Generator, On-Site Standby. (On-Site Standby Generator)

A facility producing electric power on site as the alternate supply of electric power. It differs from an on-site power production facility in that it is not constantly producing power. (695) (CMP-13)

Grid Bus Rail.

A combination of the busbar, the busbar support, and the structural suspended ceiling grid system. (393) (CMP-18)

Ground.

The earth. (CMP-5)

Ground-Fault Circuit Interrupter (GFCI).

A device intended for the protection of personnel that functions to de-energize a circuit or portion thereof within an established period of time when a ground-fault current exceeds the values established for a Class A device. (CMP-2)

> Informational Note: Class A ground-fault circuit interrupters trip when the ground-fault current is 6 mA or higher and do not trip when the ground-fault current is less than 4 mA. For further information, see UL 943, *Standard for Ground-Fault Circuit Interrupters.*

Ground-Fault Condition.

An unintentional, electrically conductive connection between an ungrounded conductor of an electrical circuit and the normally non-current-carrying conductors, metallic enclosures, metallic raceways, metallic equipment, or earth. (CMP-5)

Ground-Fault Current Path.

An electrically conductive path from the point of a ground fault on a wiring system through normally non–current-carrying conductors, grounded conductors, equipment, or the earth to the electrical supply source. (CMP-5)

> Informational Note: Examples of ground-fault current paths are any combination of equipment grounding conductors, metallic raceways, metallic cable sheaths, electrical equipment, and any other electrically conductive material such as metal, water, and gas piping; steel framing members; stucco mesh; metal ducting; reinforcing steel; shields of communications cables; grounded conductors; and the earth itself.

Ground-Fault Current Path, Effective. (Effective Ground-Fault Current Path)

An intentionally constructed, low-impedance electrically conductive path designed and intended to carry current under ground-fault conditions from the point of a ground fault on a wiring system to the electrical supply source and that facilitates the operation of the overcurrent protective device or ground-fault detectors. (CMP-5)

Ground-Fault Detector Interrupter (GFDI).

A device that provides ground-fault protection for PV dc circuits. (690) (CMP-4)

> Informational Note: See UL 1741, *Standard for Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resource* , for further information on GFDI equipment.

Ground-Fault Protection of Equipment. (GFPE).

A system intended to provide protection of equipment from damaging line-to-ground fault currents by operating to cause a disconnecting means to open all ungrounded conductors of the faulted circuit. This protection is provided at current levels less than those required to protect conductors from damage through the operation of a supply circuit overcurrent device. (CMP-5)

Grounded (Grounding).

Connected (connecting) to ground or to a conductive body that extends the ground connection. (CMP-5)

Grounded, Functionally. (Functionally Grounded)

A system that has an electrical ground reference for operational purposes that is not solidly grounded. (712) (CMP-13)

> Informational Note: Examples of operational reasons for functionally grounded systems include ground-fault detection and performance-related issues for some power sources.

Grounded, Functionally. (Functionally Grounded)

A system that has an electrical ground reference for operational purposes that is not solidly grounded. (CMP-4)

> Informational Note: A functionally grounded system is often connected to ground through an electronic means internal to an inverter or charge controller that provides ground-fault protection. Examples of operational purposes for functionally grounded systems include ground-fault detection and performance-related issues for some power sources.

Grounded, Solidly.

Connected to ground without inserting any resistor or impedance device. (CMP-5)

Grounded Conductor.

A system or circuit conductor that is intentionally grounded. (CMP-5)

> Informational Note: Although an equipment grounding conductor is grounded, it is not considered a grounded conductor.

Grounded Conductor, Impedance. (Impedance Grounded Conductor)

A conductor that connects the system neutral point to the impedance device in an impedance grounded system. (CMP-5)

Grounded System, Impedance. (Impedance Grounded System)

An electrical system that is grounded by intentionally connecting the system neutral point to ground through an impedance device. (CMP-5)

Grounding Conductor, Equipment (EGC).

A conductive path(s) that is part of an effective ground-fault current path and connects normally non-current-carrying metal parts of equipment together and to the system grounded conductor or to the grounding electrode conductor, or both. (CMP-5)

> Informational Note No. 1: It is recognized that the equipment grounding conductor also performs bonding.

> Informational Note No. 2: See 250.118 for a list of acceptable equipment grounding conductors.

Grounding Electrode.

A conducting object through which a direct connection to earth is established. (CMP-5)

Grounding Electrode Conductor (GEC).

A conductor used to connect the system grounded conductor or the equipment to a grounding electrode or to a point on the grounding electrode system. (CMP-5)

Grouped.

Cables or conductors positioned adjacent to one another but not in continuous contact with each other. (520) (CMP-15)

Guarded.

Covered, shielded, fenced, enclosed, or otherwise protected by means of suitable covers, casings, barriers, rails, screens, mats, or platforms to remove the likelihood of approach or contact by persons or objects to a point of danger. (CMP-1)

Guest Room.

An accommodation combining living, sleeping, sanitary, and storage facilities within a compartment. (CMP-2)

Guest Suite.

An accommodation with two or more contiguous rooms comprising a compartment, with or without doors between such rooms, that provides living, sleeping, sanitary, and storage facilities. (CMP-2)

Gutter, Metal Auxiliary. (Metal Auxiliary Gutter)

A sheet metal enclosure used to supplement wiring spaces at meter centers, distribution centers, switchgear, switchboards, and similar points of wiring systems. The enclosure has hinged or removable covers for housing and protecting electrical wires, cable, and busbars. The enclosure is designed for conductors to be laid or set in place after the enclosures have been installed as a complete system. (CMP-8)

Gutter, Nonmetallic Auxiliary. (Nonmetallic Auxiliary Gutter)

A flame-retardant, nonmetallic enclosure used to supplement wiring spaces at meter centers, distribution centers, switchgear, switchboards, and similar points of wiring systems. The enclosure has hinged or removable covers for housing and protecting electrical wires, cable, and busbars. The enclosure is designed for conductors to be laid or set in place after the enclosures have been installed as a complete system. (CMP-8)

Habitable Room.

A room in a building for living, sleeping, eating, or cooking, but excluding bathrooms, toilet rooms, closets, hallways, storage or utility spaces, and similar areas. (CMP-2)

Handhole Enclosure.

An enclosure for use in underground systems, provided with an open or closed bottom, and sized to allow personnel to reach into, but not enter, for the purpose of installing, operating, or maintaining equipment or wiring or both. (CMP-9)

Hazard Current.

For a given set of connections in an isolated power system, the total current that would flow through a low impedance if it were connected between either isolated conductor and ground. [99:3.3.72] (517) (CMP-15)

Fault Hazard Current (as applied to hazard current).

The hazard current of a given isolated power system with all devices connected except the line isolation monitor. [**99:** 3.3.72.1] (517) (CMP-15)

Monitor Hazard Current (as applied to hazard current).

The hazard current of the line isolation monitor alone. [**99:** 3.3.72.2] (517) (CMP-15)

Total Hazard Current (as applied to hazard current).

The hazard current of a given isolated system with all devices, including the line isolation monitor, connected. [**99:** 3.3.72.3] (517) (CMP-15)

Hazardous (Classified) Locations.

Locations where fire or explosion hazards might exist due to flammable gases, flammable liquid–produced vapors, combustible liquid–produced vapors, combustible dusts, combustible fiber/flyings, or ignitible fibers/flyings. (CMP-14)

Header.

Transverse metal raceways for electrical conductors, providing access to predetermined cells of a precast cellular concrete floor, thereby permitting the installation of electrical conductors from a distribution center to the floor cells. (CMP-8)

Health Care Facilities.

Buildings, portions of buildings, or mobile enclosures in which human medical, dental, psychiatric, nursing, obstetrical, or surgical care is provided. [**99:** 3.3.73] (CMP-15)

> Informational Note: Examples of health care facilities include, but are not limited to, hospitals, nursing homes, limited care facilities, clinics, medical and dental offices, and ambulatory care centers, whether permanent or movable.

Health Care Facility's Governing Body.

The person or persons who have the overall legal responsibility for the operation of a health care facility. [**99:** 3.3.74] (517) (CMP-15)

Health Care Microgrid.

A group of interconnected loads and distributed energy resources within clearly defined boundaries that acts as a single controllable entity with respect to the utility. [**99:** 3.3.75] (517) (CMP-15)

Heating Equipment.

Any equipment that is used for heating purposes and whose heat is generated by induction or dielectric methods. (665) (CMP-12)

Heating Panel.

A complete assembly provided with a junction box or a length of flexible conduit for connection to a branch circuit. (CMP-17)

Heating Panel Set.

A rigid or nonrigid assembly provided with nonheating leads or a terminal junction assembly identified as being suitable for connection to a wiring system. (CMP-17)

Heating System.

A complete system consisting of components such as heating elements, fastening devices, nonheating circuit wiring, leads, temperature controllers, safety signs, junction boxes, raceways, and fittings. (426) (CMP-17)

Heating System, Impedance. (Impedance Heating System)

A system in which heat is generated in an object, such as a pipe, rod, or combination of such objects serving as a heating element, by causing current to flow through such objects by direct connection to an ac voltage source from an isolating transformer. In some installations the object is embedded in the surface to be heated or constitutes the exposed component to be heated. (CMP-17)

Heating System, Induction. (Induction Heating System)

A system in which heat is generated in a pipeline or vessel wall by inducing current in the pipeline or vessel wall from an external isolated ac field source. (CMP-17)

Heating System, Skin Effect. (Skin-Effect Heating System)

A system in which heat is generated on the inner surface of a ferromagnetic envelope embedded in or fastened to the surface to be heated.

> Informational Note: Typically, an electrically insulated conductor is routed through and connected to the envelope at the other end. The envelope and the electrically insulated conductor are connected to an ac voltage source from an isolating transformer. (CMP-17)

Hermetic Refrigerant Motor-Compressor.

A combination consisting of a compressor and motor, both of which are enclosed in the same housing, with no external shaft or shaft seals, with the motor operating in the refrigerant. (CMP-11)

Hermetically Sealed.

Sealed against the entrance of an external atmosphere, such that the seal is made by fusion of metal, ceramic to metal, or glass to metal. (CMP-14)

> Informational Note: See ANSI/UL 121201-2017, *Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations* , for additional information.

High Voltage.

A potential difference of more than 1000 volts, nominal. (CMP-9)

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

Hoistway.

Any shaftway, hatchway, well hole, or other vertical opening or space in which an elevator or dumbwaiter is designed to operate. (CMP-12)

Hospital.

A building or portion thereof used on a 24-hour basis for the medical, psychiatric, obstetrical, or surgical care of four or more inpatients. [***101*** : 3.3.152] (CMP-15)

Host Sign.

A sign or outline lighting system already installed in the field that is designated for field conversion of the illumination system with a retrofit kit. (600) (CMP-18)

Hydromassage Bathtub.

A permanently installed bathtub equipped with a recirculating piping system, pump, and associated equipment. It is designed so it can accept, circulate, and discharge water upon each use. (680) (CMP-17)

Identified (as applied to equipment).

Recognizable as suitable for the specific purpose, function, use, environment, application, and so forth, where described in a particular *Code* requirement. (CMP-1)

> 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 organizations concerned with product evaluation.

In Sight From (Within Sight From, Within Sight).

Where this *Code* specifies that one equipment shall be "in sight from," "within sight from," or "within sight of," and so forth, another equipment, the specified equipment is to be visible and not more than 15 m (50 ft) distant from the other. (CMP-1)

Increased Safety "e".

Type of protection applied to electrical equipment that does not produce arcs or sparks in normal service and under specified abnormal conditions, in which additional measures are applied so as to give increased security against the possibility of excessive temperatures and of the occurrence of arcs and sparks. (505) (CMP-14)

> Informational Note: See ANSI/UL 60079-7-2017, *Explosive Atmospheres — Part 7: Equipment Protection by Increased Safety "e".*

Induction Heating (Induction Melting) (Induction Welding).

The heating, melting, or welding of a nominally conductive material due to its own I2R losses when the material is placed in a varying electromagnetic field. (665) (CMP-12)

Industrial Control Panel.

An assembly of two or more components consisting of one of the following: (1) power circuit components only, such as motor controllers, overload relays, fused disconnect switches, and circuit breakers; (2) control circuit components only, such as push buttons, pilot lights, selector switches, timers, switches, and control relays; (3) a combination of power and control circuit components. These components, with associated wiring and terminals, are mounted on, or contained within, an enclosure or mounted on a subpanel.

The industrial control panel does not include the controlled equipment. (CMP-11)

Industrial Establishment [as applied to hazardous (classified) locations].

A building(s) or structure(s) approved for industrial use by the authority having jurisdiction with restricted access where the conditions of maintenance and engineering supervision ensure that only qualified persons design, install, operate, and service the installation. (CMP-14)

Information Technology Equipment (ITE).

Equipment and systems rated 1000 volts or less, normally found in offices or other business establishments and similar environments classified as ordinary locations, that are used for creation and manipulation of data, voice, video, and similar signals that are not communications equipment as defined in Part I of Article 100 and do not process communications circuits as defined in 805.2. (CMP-12)

> Informational Note: For information on listing requirements for both information technology equipment and communications equipment, see UL 60950-1-2014, *Information Technology Equipment — Safety — Part 1: General Requirements* or UL 62368-1-2014, *Audio/Video Information and Communication Technology Equipment Part 1: Safety Requirements* .

Information Technology Equipment Room.

A room within the information technology equipment area that contains the information technology equipment. [**75:** 3.3.14] (CMP-12)

Inherently Safe Optical Radiation “op is”.

Type of protection to minimize the risk of ignition in explosive atmospheres from optical radiation where visible or infrared radiation is incapable of producing sufficient energy under normal or specified fault conditions to ignite a specific explosive atmosphere. (CMP-14)

> Informational Note: See ANSI/UL 60079-28-2017, *Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation* .

Innerduct.

A nonmetallic raceway placed within a larger raceway. (CMP-16)

Instrumentation Tray Cable (Type ITC).

A factory assembly of two or more insulated conductors, with or without an equipment grounding conductor(s), enclosed in a nonmetallic sheath. (CMP-3)

Insulating End, Type FCC.

An insulator designed to electrically insulate the end of a Type FCC cable. (324) (CMP-6)

Integrated Gas Spacer Cable, Type IGS.

A factory assembly of one or more conductors, each individually insulated and enclosed in a loose fit, nonmetallic flexible conduit as an integrated gas spacer cable rated 0 volts through 600 volts. (CMP-6)

Interactive Mode.

The operating mode for power production equipment that is operating in parallel with and capable of delivering energy to an electric power production and distribution network or other primary source. (CMP-4)

Interrupting Rating.

The highest current at rated voltage that a device is identified to interrupt under standard test conditions. (CMP-10)

> Informational Note: Equipment intended to interrupt current at other than fault levels may have its interrupting rating implied in other ratings, such as horsepower or locked rotor current.

Intersystem Bonding Termination (IBT).

A device that provides a means for connecting intersystem bonding conductors for communications systems to the grounding electrode system. (CMP-16)

Intrinsic Safety “i”.

Type of protection where any spark or thermal effect is incapable of causing ignition of a mixture of flammable or combustible material in air under prescribed test conditions. (CMP-14)

> Informational Note: See UL 913-2015, *Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1 Hazardous (Classified) Locations* ; and ANSI/UL 60079-11-2013, *Explosive Atmospheres — Part 11: Equipment Protection by Intrinsic Safety “i”.*

Intrinsically Safe Apparatus.

Apparatus in which all the circuits are intrinsically safe. (CMP-14)

Intrinsically Safe Circuit.

A circuit in which any spark or thermal effect is incapable of causing ignition of a mixture of flammable or combustible material in air under prescribed test conditions. (CMP-14)

Informational Note: Test conditions are described in ANSI/UL 913-2013, *Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous (Classified) Locations* .

Intrinsically Safe System.

An assembly of interconnected intrinsically safe apparatus, associated apparatus, and interconnecting cables, in which those parts of the system that might be used in hazardous (classified) locations are intrinsically safe circuits. (504) (CMP-14)

Informational Note: An intrinsically safe system might include more than one intrinsically safe circuit.

Invasive Procedure.

Any procedure that penetrates the protective surfaces of a patient's body (i.e., skin, mucous membrane, cornea) and that is performed with an aseptic field (procedural site). [Not included in this category are placement of peripheral intravenous needles or catheters used to administer fluids and/or medications, gastrointestinal endoscopies (i.e., sigmoidoscopies), insertion of urethral catheters, and other similar procedures.] [**99:** 3.3.91] (517) (CMP-15)

Inverter.

Equipment that changes dc to ac. (CMP-4)

Inverter, Interactive. (Interactive Inverter)

Inverter equipment having the capability to operate only in interactive mode. (CMP-13)

Inverter, Multimode. (Multimode Inverter)

Inverter equipment capable of operating in both interactive and island modes. (CMP-4)

Inverter, Stand-alone. (Stand-alone Inverter)

Inverter equipment having the capabilities to operate only in island mode. (CMP-4)

Inverter Input Circuit.

Conductors connected to the dc input of an inverter. (CMP-13)

Inverter Output Circuit.

Conductors connected to the ac output of an inverter. (CMP-13)

Inverter Utilization Output Circuit.

Conductors between the multimode or stand-alone inverter and utilization equipment. (706) (CMP-13)

Irrigation Machine.

An electrically driven or controlled machine, with one or more motors, not hand-portable, and used primarily to transport and distribute water for agricultural purposes. (675) (CMP-7)

Irrigation Machine, Center Pivot (Center Pivot Irrigation Machine). .

A multimotored irrigation machine that revolves around a central pivot and employs alignment switches or similar devices to control individual motors. (675) (CMP-7)

Isolated Power System.

A system comprising an isolation transformer or its equivalent, a line isolation monitor, and its ungrounded circuit conductors. [**99:** 3.3.93] (517) (CMP-15)

Isolation Transformer.

A transformer of the multiple-winding type, with the primary and secondary windings physically separated, that inductively couples its ungrounded secondary winding to the grounded feeder system that energizes its primary winding. [**99:** 3.3.94] (517) (CMP-15)

Island Mode.

The operating mode for power production equipment that is disconnected from an electric power production and distribution network or other primary power source and capable of delivering energy to loads. (CMP-4)

Isolated (as applied to location).

Not readily accessible to persons unless special means for access are used. (CMP-1)

Kitchen.

An area with a sink and permanent provisions for food preparation and cooking. (CMP-2)

Labeled.

Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner. (CMP-1)

Informational Note: If a listed product is of such a size, shape, material, or surface texture that it is not possible to apply legibly the complete label to the product, the complete label may appear on the smallest unit container in which the product is packaged.

Laundry Area.

An area containing or designed to contain a laundry tray, clothes washer, or clothes dryer. (CMP-2)

LED Sign Illumination System.

A complete lighting system for use in signs and outline lighting consisting of light-emitting diode (LED) light sources, power supplies, wire, and connectors to complete the installation. (600) (CMP-18)

Leakage-Current Detector-Interrupter (LCDI).

A device provided in a power supply cord or cord set that senses leakage current flowing between or from the cord conductors and interrupts the circuit at a predetermined level of leakage current. (440) (CMP-11)

Legally Required Standby Systems.

Those systems required and so classed as legally required standby by municipal, state, federal, or other codes or by any governmental agency having jurisdiction. These systems are intended to automatically supply power to selected loads (other than those classed as emergency systems) in the event of failure of the normal source. (CMP-13)

Life Safety Branch.

A system of feeders and branch circuits supplying power for lighting, receptacles, and equipment essential for life safety that is automatically connected to alternate power sources by one or more transfer switches during interruption of the normal power source. [**99:** 3.3.97] (517) (CMP-15)

Lighting Assembly, Cord-and-Plug-Connected. (Cord-and-Plug-Connected Lighting Assembly)

A lighting assembly consisting of a luminaire intended for installation in the wall of a spa, hot tub, or storable pool, and a cord-and-plug-connected transformer. (680) (CMP-17)

Lighting Assembly, Through-Wall. (Through-Wall Lighting Assembly)

A lighting assembly intended for installation above grade, on or through the wall of a pool, consisting of two interconnected groups of components separated by the pool wall. (680) (CMP-17)

Lighting Outlet.

An outlet intended for the direct connection of a lampholder or luminaire. (CMP-18)

Lighting Track (Track Lighting).

A manufactured assembly designed to support and energize luminaires that are capable of being readily repositioned on the track. Its length can be altered by the addition or subtraction of sections of track. (CMP-18)

Likely to Become Energized.

Conductive material that could become energized because of electrical insulation or electrical spacing failure. (CMP-5)

Limited Care Facility.

A building or portion of a building used on a 24-hour basis for the housing of four or more persons who are incapable of self-preservation because of age; physical limitation due to accident or illness; or limitations such as intellectual disability/developmental disability, mental illness, or chemical dependency.[***101:*** 3.3.93.2] (CMP-15)

Limited Finishing Workstation.

An apparatus that is capable of confining the vapors, mists, residues, dusts, or deposits that are generated by a spray application process but does not meet the requirements of a spray booth or spray room, as herein defined. [**33:** 3.3.18.1] (516) (CMP-14)

> Informational Note: See Section 14.3 of NFPA 33, *Standard for Spray Application Using Flammable or Combustible Materials* , for information on limited finishing workstations.

Line Isolation Monitor.

A test instrument designed to continually check the balanced and unbalanced impedance from each line of an isolated circuit to ground and equipped with a built-in test circuit to exercise the alarm without adding to the leakage current hazard. [**99:** 3.3.99] (517) (CMP-15)

Listed.

Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose. (CMP-1)

> Informational Note: The means for identifying listed equipment may vary for each organization concerned with product evaluation, some of which do not recognize equipment as listed unless it is also labeled. Use of the system employed by the listing organization allows the authority having jurisdiction to identify a listed product.

Liquid Immersion “o”.

Type of protection where electrical equipment is immersed in a protective liquid so that an explosive atmosphere that might be above the liquid or outside the enclosure cannot be ignited. (505) (CMP-14)

> Informational Note: See ANSI/UL 60079-6-2016, *Explosive Atmospheres — Part 6: Equipment Protection by Liquid Immersion “o”.*

Live Parts.

Energized conductive components. (CMP-1)

Load Management.

The process of limiting the total electrical load on an electrical supply system to a set value by adjusting or controlling the individual loads. (625) (CMP-12)

> Informational Note: Load management is sometimes called *demand-side management* (DSM).

Load Management System.

Associated interconnected equipment that will actively regulate the individual loads via load control equipment such that the total load on the electrical supply system stays below a given maximum permitted total value. The system performs the task of load management. (625) (CMP-12)

> Informational Note: Load control equipment consists of equipment or modules within a piece of equipment that communicate with individual loads and other load control equipment within a load management system to manage the total load on the electrical supply system. The communications between load control equipment, as well as the implementation of the control process, may be achieved through hardware, software, or a combination of both.

Location (Shooting Location).

A place outside a motion picture studio where a production or part of a production is filmed or recorded. (530) (CMP-15)

Location Board (Deuce Board).

Portable equipment containing a lighting contactor(s) and overcurrent protection designed for remote control of stage lighting. (530) (CMP-15)

Location, Damp.

Locations protected from weather and not subject to saturation with water or other liquids but subject to moderate degrees of moisture. (CMP-1)

> Informational Note: Examples of such locations include partially protected locations under canopies, marquees, roofed open porches, and like locations, and interior locations subject to moderate degrees of moisture, such as some basements, some barns, and some cold-storage warehouses.

Location, Dry.

A location not normally subject to dampness or wetness. A location classified as dry may be temporarily subject to dampness or wetness, as in the case of a building under construction. (CMP-1)

Location, Wet.

A location that is one or more of the following:

(1) Unprotected and exposed to weather

(2) Subject to saturation with water and other liquids

(3) Underground

(4) In concrete slabs or masonry in direct contact with the earth

(CMP-1)

> Informational Note: A vehicle washing area is an example of a wet location saturated with water or other liquids.

Long-Time Rating (as applied to nonmedical X-ray equipment).

A rating based on an operating interval of 5 minutes or longer. (660) (CMP-12)

Long-Time Rating (Standby Power).

A rating based on an operating interval of 5 minutes or longer. (CMP-15)

Low Voltage (as applied to recreational vehicles).

An electromotive force rated 24 volts, nominal, or less. (551) (CMP-7)

Low-Voltage Contact Limit.

A voltage not exceeding the following values:

(1) 15 volts (RMS) for sinusoidal ac

(2) 21.2 volts peak for nonsinusoidal ac

(3) 30 volts for continuous dc

(4) 12.4 volts peak for dc that is interrupted at a rate of 10 to 200 Hz

(680) (CMP-17)

Low-Voltage Suspended Ceiling Power Distribution System.

A system that serves as a support for a finished ceiling surface and consists of a busbar and busbar support system to distribute power to utilization equipment supplied by a Class 2 power supply. (393) (CMP-18)

Loudspeaker.

Equipment that converts an ac electric signal into an acoustic signal. The term speaker is commonly used to mean *loudspeaker* . (640) (CMP-12)

Luminaire.

A complete lighting unit consisting of a light source such as a lamp or lamps, together with the parts designed to position the light source and connect it to the power supply. It may also include parts to protect the light source or the ballast or to distribute the light. A lampholder itself is not a luminaire. (CMP-18)

Luminaire, Dry-Niche. (Dry-Niche Luminaire)

A luminaire intended for installation in the floor or wall of a pool, spa, or fountain in a niche that is sealed against the entry of water. (680) (CMP-17)

Luminaire, Emergency,Directly Controlled. (Directly Controlled Emergency Luminaire)

A luminaire supplied by the facility emergency power system and with a control input for dimming or switching that provides an emergency illumination level upon loss of normal power. (700) (CMP-13)

Informational Note: See ANSI/UL 924, Emergency Lighting and Power Equipment, for information covering directly controlled emergency luminaires.

Luminaire, No-Niche. (No-Niche Luminaire)

A luminaire intended for installation above or below the water without a niche. (680) (CMP-17)

Luminaire, Wet-Niche. (Wet-Niche Luminaire)

A luminaire intended for installation in a forming shell mounted in a pool or fountain structure where the luminaire will be completely surrounded by water. (680) (CMP-17)

Machine Room (as applied to elevator, dumbwaiter).

An enclosed machinery space outside the hoistway, intended for full bodily entry, that contains the electrical driving machine or the hydraulic machine. The room could also contain electrical and/or mechanical equipment used directly in connection with the elevator or dumbwaiter. (620) (CMP-12)

Machine Room and Control Room, Remote (as applied to elevator, dumbwaiter). (Remote Machine Room and Control Room)

A machine room or control room that is not attached to the outside perimeter or surface of the walls, ceiling, or floor of the hoistway. (620) (CMP-12)

Machinery, Industrial. (Industrial Machinery) (Industrial Machine)

A power-driven machine (or a group of machines working together in a coordinated manner), not portable by hand while working, that is used to process material by cutting; forming; pressure; electrical, thermal, or optical techniques; lamination; or a combination of these processes. It can include associated equipment used to transfer material or tooling, including fixtures, to assemble/disassemble, to inspect or test, or to package. [The associated electrical equipment, including the logic controller(s) and associated software or logic together with the machine actuators and sensors, are considered as part of the industrial machine.] (CMP-12)

Machinery Space (as applied to elevator, dumbwaiter, platform lift, and stairway chairlift).

A space inside or outside the hoistway, intended to be accessed with or without full bodily entry, that contains the elevator, dumbwaiter, platform lift, or stairway chairlift equipment and could also contain equipment used directly in connection with the elevator, dumbwaiter, platform lift, or stairway chairlift. (620) (CMP-12)

Machinery Space and Control Space, Remote (as applied to elevator, dumbwaiter). (Remote Machinery Space and Control Space)

A machinery space or control space that is not within the hoistway, machine room, or control room and that is not attached to the outside perimeter or surface of the walls, ceiling, or floor of the hoistway. (620) (CMP-12)

Major Repair Garage.

A building or portions of a building where major repairs, such as engine overhauls, painting, body and fender work, and repairs that require draining of the motor vehicle fuel tank are performed on motor vehicles, including associated floor space used for offices, parking, or showrooms. [**30A:** 3.3.12.1] (511) (CMP-14)

Manufactured Home.

A structure, transportable in one or more sections, which in the traveling mode is 2.4 m (8 ft) or more in width or 12.2 m (40 ft) or more in length, or when erected on site is 29.77 m2 (320 ft2) or more is built on a permanent chassis and is designed to be used as a dwelling with or without a permanent foundation, whether or not connected to the utilities, and includes plumbing, heating, air conditioning, and electrical systems contained therein. The term *manufactured home* includes any structure that meets all the requirements of this paragraph except the size requirements and with respect to which the manufacturer voluntarily files a certification required by the regulatory agency. Calculations used to determine the number of square meters (square feet) in a structure are based on the structure's exterior dimensions and include all expandable rooms, cabinets, and other projections containing interior space, but do not include bay windows. [**501:** 1.2.13] For the purpose of this *Code* and unless otherwise indicated, the term mobile home includes manufactured homes and excludes park trailers defined in 552.4. (CMP-7)

Informational Note No. 1: See the applicable building code for definition of the term *permanent foundation* .

Informational Note No. 2: See 24 CFR Part 3280, *Manufactured Home Construction and Safety Standards, of the Federal Department of Housing and Urban Development* , for additional information on the definition.

Manufactured Wiring System.

A system containing component parts that are assembled in the process of manufacture and cannot be inspected at the building site without damage or destruction to the assembly and used for the connection of luminaires, utilization equipment, continuous plug-in type busways, and other devices. (604) (CMP-7)

Marina.

A facility, generally on the waterfront, that stores and services boats in berths, on moorings, and in dry storage or dry stack storage. [**303:** 3.3.12] (555) (CMP-7)

Maximum Output Power.

The maximum power delivered by an amplifier into its rated load as determined under specified test conditions. (640) (CMP-12)

Informational Note: The maximum output power can exceed the manufacturer’s rated output power for the same amplifier.

Maximum Output Power.

The maximum 1 minute average power output a wind turbine produces in normal steady-state operation (instantaneous power output can be higher). (694) (CMP-4)

Maximum Voltage.

The maximum voltage the wind turbine produces in operation including open circuit conditions. (694) (CMP-4)

Maximum Water Level.

The highest level that water can reach before it spills out. (680) (CMP-17)

Medical Office.

A building or part thereof in which the following occur:

(1) Examinations and minor treatments/procedures performed under the continuous supervision of a medical professional;

(2) The use of limited to minimal sedation and treatment or procedures that do not render the patient incapable of self-preservation under emergency conditions; and

(3) No overnight stays for patients or 24-hour operations.

[**99:** 3.3.110] (CMP-15)

Membrane Enclosure.

A temporary enclosure used for the spraying of workpieces that cannot be moved into a spray booth where open spraying is not practical due to proximity to other operations, finish quality, or concerns such as the collection of overspray. (516) (CMP-14)

> Informational Note: See Chapter 18 of NFPA 33-2021, *Standard for Spray Application Using Flammable or Combustible Materials* , for information on the construction and use of membrane enclosures.

Messenger-Supported Wiring.

An exposed wiring support system using a messenger wire to support insulated conductors by any one of the following:

(1) A messenger with rings and saddles for conductor support

(2) A messenger with a field-installed lashing material for conductor support

(3) Factory-assembled aerial cable

(4) Multiplex cables utilizing a bare conductor, factory assembled and twisted with one or more insulated conductors, such as duplex, triplex, or quadruplex type of construction

(CMP-6)

Messenger or Messenger Wire.

A wire that is run along with or integral with a cable or conductor to provide mechanical support for the cable or conductor. (CMP-6)

Metal Clad Cable, Type MC.

A factory assembly of one or more insulated circuit conductors with or without optical fiber members enclosed in an armor of interlocking metal tape, or a smooth or corrugated metallic sheath. (CMP-6)

Metal Shield Connections, Type FCC.

Means of connection designed to electrically and mechanically connect a metal shield to another metal shield, to a receptacle housing or self-contained device, or to a transition assembly. (324) (CMP-6)

Microgrid, Direct Current. (Direct Current Microgrid) (DC Microgrid)

A direct current microgrid is a power distribution system consisting of more than one interconnected dc power source, supplying dc-dc converter(s), dc load(s), and/or ac load(s) powered by dc-ac inverter(s). A dc microgrid is typically not directly connected to an ac primary source of electricity, but some dc microgrids interconnect via one or more dc-ac bidirectional converters or dc-ac inverters. (712) (CMP-13)

> Informational Note: Direct current power sources include ac-dc converters (rectifiers), bidirectional dc-ac inverters/converters, photovoltaic systems, wind generators, energy storage systems (including batteries), and fuel cells.

Microgrid Control System (MCS).

A structured control system that manages microgrid operations, functionalities for utility interoperability, islanded operations, and transitions. (CMP-4)

> Informational Note: MCS differ from multiple standby generators or UPSs that are evaluated and rated to operate as a single source of backup power upon loss of the primary power source. MCS functions include coordination, transitions, and interoperability between multiple power sources.

Microgrid Interconnect Device (MID).

A device that enables a microgrid system to operate in island mode while separated from a primary source and to reconnect to the primary power source. (CMP-4)

> Informational Note: Microgrid controllers typically are used to measure and evaluate electrical parameters and provide the logic for the signal to initiate and complete transition processes. IEEE Std 2030.7-2017, *IEEE Standard for the Specification of Microgrid Controllers* , and IEEE Std 2030.8-2018, IEEE *Standard for the Testing of Microgrid Controllers* , provide information on microgrid controllers. IEEE Std 1547-2018, IEEE *Standard for Interconnection and Interoperability of Distributed Energy Resources with Associated Electric Power Systems Interfaces* , provides information on interconnection requirements.

Microgrid System

A system interconnected to an electric power production and distribution network or other primary power source capable of operating in parallel, that includes the ability to disconnect from the primary source and operate in island mode. (CMP-4)

Informational Note: The application of Article 705 to microgrid systems is limited by the exclusions in 90.2(B)(5) related to electric utilities. Additional information may be found in IEEE 1547, IEEE 2030.7, and IEEE 2030.8.

Mineral-Insulated, Metal-Sheathed Cable, Type MI.

A factory assembly of one or more conductors insulated with a highly compressed refractory mineral insulation and enclosed in a liquidtight and gastight continuous copper or alloy steel sheath. (CMP-6)

Minor Repair Garage.

A building or portions of a building used for lubrication, inspection, and minor automotive maintenance work, such as engine tune-ups, replacement of parts, fluid changes (e.g., oil, antifreeze, transmission fluid, brake fluid, air-conditioning refrigerants), brake system repairs, tire rotation, and similar routine maintenance work, including the associated floor space used for offices, parking, or showrooms. [**30A:** 3.3.12.2] (511) (CMP-14)

Mixer.

Equipment used to combine and level match a multiplicity of electronic signals, such as from microphones, electronic instruments, and recorded audio. (640) (CMP-12)

Mobile (as applied to nonmedical X-ray equipment).

X-ray equipment mounted on a permanent base with wheels and/or casters for moving while completely assembled. (660) (CMP-12)

Mobile Equipment.

Equipment with electrical components that is suitable to be moved only with mechanical aids or is provided with wheels for movement by a person(s) or powered devices. (513) (CMP-14)

Mobile Home.

A factory-assembled structure or structures transportable in one or more sections that are built on a permanent chassis and designed to be used as a dwelling without a permanent foundation where connected to the required utilities and that include the plumbing, heating, air-conditioning, and electrical systems contained therein.

For the purpose of this *Code* and unless otherwise indicated, the term *mobile home* includes manufactured homes. (CMP-7)

Mobile Home Accessory Building or Structure.

Any awning, cabana, ramada, storage cabinet, carport, fence, windbreak, or porch established for the use of the occupant of the mobile home on a mobile home lot. (550) (CMP-7)

Mobile Home Lot.

A designated portion of a mobile home park designed for the accommodation of one mobile home and its accessory buildings or structures for the exclusive use of its occupants. (550) (CMP-7)

Mobile Home Park.

A contiguous parcel of land that is used for the accommodation of occupied mobile homes. (550) (CMP-7)

Module.

A complete, environmentally protected unit consisting of solar cells and other components designed to produce dc power. (690) (CMP-4)

Momentary Rating (as applied to nonmedical X-ray equipment).

A rating based on an operating interval that does not exceed 5 seconds. (660) (CMP-12)

Momentary Rating (Maximum Power).

A rating based on an operating interval that does not exceed 5 seconds. (CMP-15)

Monitor.

An electrical or electronic means to observe, record, or detect the operation or condition of the electric power system or apparatus. (750) (CMP-13)

Monopole Circuit.

An electrical subset of a PV system that has two conductors in the output circuit, one positive (+) and one negative (−). (690) (CMP-4)

Monorail.

Overhead track and hoist system for moving material around the boatyard or moving and launching boats. [**303:** 3.3.15] (555) (CMP-7)

Mooring(s).

Any place where a boat is wet stored or berthed. [**303:** 3.3.16] (555) (CMP-7)

Motion Picture Studio (Lot).

A building or group of buildings and other structures designed, constructed, or permanently altered for use by the entertainment industry for the purpose of motion picture or television production. (CMP-15)

Motor Control Center.

An assembly of one or more enclosed sections having a common power bus and principally containing motor control units. (CMP-11)

Motor Fuel Dispensing Facility.

That portion of a property where motor fuels are stored and dispensed from fixed equipment into the fuel tanks of motor vehicles or marine craft or into approved containers, including all equipment used in connection therewith. [**30A:** 3.3.11] (514) (CMP-14)

Informational Note: See 511.1 with respect to electrical wiring and equipment for other areas used as lubritoriums, service rooms, repair rooms, offices, salesrooms, compressor rooms, and similar locations.

Motor Home.

A vehicular unit designed to provide temporary living quarters for recreational, camping, or travel use built on or permanently attached to a self-propelled motor vehicle chassis or on a chassis cab or van that is an integral part of the completed vehicle. *(See Recreational Vehicle.)* (551) (CMP-7)

Multioutlet Assembly.

A surface, flush, or freestanding assemblage consisting of a raceway and fittings or other enclosure provided with one or more receptacles, for the purpose of supplying power to utilization equipment. (CMP-18)

Multi-Circuit Cable Outlet Enclosure.

An enclosure containing one or more multi-circuit plugs, receptacles, or both. (520) (CMP-15)

Nacelle.

An enclosure housing the alternator and other parts of a wind turbine. (694) (CMP-4)

Natural Bodies of Water.

Bodies of water such as lakes, streams, ponds, rivers, and other naturally occurring bodies of water, which may vary in depth throughout the year. (682) (CMP-17)

Neon Tubing.

Electric-discharge luminous tubing, including cold cathode luminous tubing, that is manufactured into shapes to illuminate signs, form letters, parts of letters, skeleton tubing, outline lighting, other decorative elements, or art forms and filled with various inert gases. (600) (CMP-18)

Network Interface Unit (NIU).

A device that converts a broadband signal into component voice, audio, video, data, and interactive services signals and provides isolation between the network power and the premises signal circuits. These devices often contain primary and secondary protectors. (CMP-16)

Network Terminal.

A device that converts network-provided signals (optical, electrical, or wireless) into component signals, including voice, audio, video, data, wireless, optical, and interactive services, and is considered a network device on the premises that is connected to a communications service provider and is powered at the premises. (CMP-16)

Neutral Conductor.

The conductor connected to the neutral point of a system that is intended to carry current under normal conditions. (CMP-5)

Neutral Point.

The common point on a wye-connection in a polyphase system or midpoint on a single-phase, 3-wire system, or midpoint of a single-phase portion of a 3-phase delta system, or a midpoint of a 3-wire, direct-current system. (CMP-5)

Informational Note: At the neutral point of the system, the vectorial sum of the nominal voltages from all other phases within the system that utilize the neutral, with respect to the neutral point, is zero potential.

Nominal Voltage (as applied to battery or cell).

The value assigned to a cell or battery of a given voltage class for the purpose of convenient designation. The operating voltage of the cell or battery may vary above or below this value. (CMP-13)

Informational Note: The most common nominal cell voltages are 2 volts per cell for the lead-acid batteries, 1.2 volts per cell for alkali batteries, and 3.2 to 3.8 volts per cell for Li-ion batteries. Nominal voltages might vary with different chemistries.

Nonautomatic.

Requiring human intervention to perform a function. (CMP-1)

Nonincendive Circuit.

A circuit, other than field wiring, in which any arc or thermal effect produced under intended operating conditions of the equipment, is not capable, under specified test conditions, of igniting the flammable gas–air, vapor–air, or dust–air mixture. (CMP-14)

Informational Note: See ANSI/UL 121201-2017, *Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations* , for further information.

Nonincendive Component.

A component having contacts for making or breaking an incendive circuit and the contacting mechanism is constructed so that the component is incapable of igniting the specified flammable gas–air or vapor–air mixture. The housing of such a component is not intended to exclude the flammable atmosphere or contain an explosion. (CMP-14)

Informational Note: For further information, see ANSI/UL 121201-2017, *Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations.*

Nonincendive Equipment.

Equipment having electrical/electronic circuitry that is incapable, under normal operating conditions, of causing ignition of a specified flammable gas–air, vapor–air, or dust–air mixture due to arcing or thermal means. (CMP-14)

Informational Note: For further information, see ANSI/UL 121201-2017, *Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations* .

Nonincendive Field Wiring.

Wiring that enters or leaves an equipment enclosure and, under normal operating conditions of the equipment, is not capable, due to arcing or thermal effects, of igniting the flammable gas–air, vapor–air, or dust–air mixture. Normal operation includes opening, shorting, or grounding the field wiring. (CMP-14)

Nonincendive Field Wiring Apparatus.

Apparatus intended to be connected to nonincendive field wiring. (500) (CMP-14)

Informational Note: For further information, see ANSI/UL 121207-2017, *Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations* .

Nonlinear Load.

A load where the wave shape of the steady-state current does not follow the wave shape of the applied voltage. (CMP-1)

Informational Note: Electronic equipment, electronic/electric-discharge lighting, adjustable-speed drive systems, and similar equipment may be nonlinear loads.

Nonmetallic-Sheathed Cable.

A factory assembly of two or more insulated conductors enclosed within an overall nonmetallic jacket. (CMP-6)

Nonmetallic-Sheathed Cable, Type NM.

Insulated conductors enclosed within an overall nonmetallic jacket. (CMP-6)

Nonmetallic-Sheathed Cable, Type NMC.

Insulated conductors enclosed within an overall, corrosion resistant, nonmetallic jacket. (CMP-6)

Nonmetallic Extension.

An assembly of two insulated conductors within a nonmetallic jacket or an extruded thermoplastic covering. The classification includes surface extensions intended for mounting directly on the surface of walls or ceilings. (CMP-6)

Nonprofessional Projector.

Those types of projectors that do not comply with the definition of *Professional-Type Projector* . (540) (CMP-15)

Non-Power-Limited Fire Alarm Circuit (NPLFA).

A fire alarm circuit powered by a source that complies with the requirements of 760.41 and 760.43. (CMP-3)

Nonsparking.

Constructed to minimize the risk of arcs or sparks capable of creating an ignition hazard during conditions of normal operation. (500) (CMP-14)

Informational Note: See ANSI/UL 121201-2017, *Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations* , for additional information.

Normal/Emergency Power Source.

A power source on the output side of a transfer switch or uninterruptible power supply that is automatically available upon loss of normal power. (700) (CMP-13).

Normal High Water Level (as applies to electrical datum plane distances).

An elevation delineating the highest water level that has been maintained for a sufficient period of time to leave evidence upon the landscape, commonly the point where the natural vegetation changes from predominantly aquatic to predominantly terrestrial. (CMP-7)

Nurses' Station.

A space intended to provide a center of nursing activity for a group of nurses serving bed patients, where patient calls are received, nurses dispatched, nurses' notes written, inpatient charts prepared, and medications prepared for distribution to patients. Where such activities are carried on in more than one location within a nursing unit, all such separate spaces are considered a to be parts of the nurses' station. (517) (CMP-15)

Nursing Home.

A building or portion of a building used on a 24-hour basis for the housing and nursing care of four or more persons who, because of mental or physical incapacity, might be unable to provide for their own needs and safety without the assistance of another person. [***101*** **:** 3.3.150.2] (CMP-15)

Occupiable Space.

A room or enclosed space designed for human occupancy. (CMP-1)

Office Furnishing.

Cubicle panels, partitions, study carrels, workstations, desks, shelving systems, and storage units that may be mechanically and electrically interconnected to form an office furnishing system. (CMP-18)

Oil Immersion.

Electrical equipment immersed in a protective liquid so that an explosive atmosphere that might be above the liquid or outside the enclosure cannot be ignited. (500) (CMP-14)

Open Wiring on Insulators.

An exposed wiring method using cleats, knobs, tubes, and flexible tubing for the protection and support of single insulated conductors run in or on buildings. (CMP-6)

Operating Device.

The car switch, pushbuttons, key or toggle switch(s), or other devices used to activate the operation controller. (620) (CMP-12)

Operator.

The individual responsible for starting, stopping, and controlling an amusement ride or supervising a concession. (525) (CMP-15)

Optical Radiation.

Electromagnetic radiation at wavelengths in vacuum between the region of transition to X-rays and the region of transition to radio waves that is approximately between 1 nm and 1000 µm. (CMP-14)

Informational Note: See ANSI/UL 60079-28-2017, *Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation* , for additional information on types of protection that can be applied to minimize the risk of ignition in explosive atmospheres from optical radiation in the wavelength range from 380 nm to 10 µm.

Optical System With Interlock “op sh”.

Type of protection to minimize the risk of ignition in explosive atmospheres from optical radiation where visible or infrared radiation is confined inside optical fiber or other transmission medium with interlock cutoff provided to reliably reduce the unconfined beam strength to safe levels within a specified time in case the confinement fails and the radiation becomes unconfined. (CMP-14)

Informational Note: See ANSI/UL 60079-28-2017, *Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation* , for additional information.

Optional Standby Systems.

Those systems intended to supply power to public or private facilities or property where life safety does not depend on the performance of the system. These systems are intended to supply on-site generated or stored power to selected loads either automatically or manually. (CMP-13)

Informational Note: Optional standby systems are typically installed to provide an alternate source of electric power for such facilities as industrial and commercial buildings, farms, and residences and to serve loads such as heating and refrigeration systems, data processing and communications systems, and industrial processes that, when stopped during any power outage, could cause discomfort, serious interruption of the process, damage to the product or process, or the like.

Organ, Electronic. (Electronic Organ)

A musical instrument that imitates the sound of a pipe organ by producing sound electronically. (CMP-12)

Informational Note: Most new electronic organs produce sound digitally and are called digital organs.

Organ, Pipe. (Pipe Organ)

A musical instrument that produces sound by driving pressurized air (called *wind*) through pipes selected via a keyboard. (CMP-12)

Outdoor Overhead Conductors.

Single conductors, insulated, covered, or bare, installed outdoors on support structures in free air. (399) (CMP-6)

Outdoor Spray Area.

A spray area that is outside the confines of a building or that has a canopy or roof that does not limit the dissipation of the heat of a fire or dispersion of flammable vapors and does not restrict fire-fighting access and control. For the purpose of this standard, an outdoor spray area can be treated as an unenclosed spray area. [**33:** 3.3.2.3.1] (516) (CMP-14)

Outlet.

A point on the wiring system at which current is taken to supply utilization equipment. (CMP-1)

Outlet Box Hood.

A housing shield intended to fit over a faceplate for flush-mounted wiring devices, or an integral component of an outlet box or of a faceplate for flush-mounted wiring devices. The hood does not serve to complete the electrical enclosure; it reduces the risk of water coming in contact with electrical components within the hood, such as attachment plugs, current taps, surge protective devices, direct plug-in transformer units, or wiring devices. (CMP-18)

Outline Lighting.

An arrangement of incandescent lamps, electric-discharge lighting, or other electrically powered light sources to outline or call attention to certain features such as the shape of a building or the decoration of a window. (CMP-18)

Output Cable to the Electric Vehicle.

An assembly consisting of a length of flexible EV cable and an electric vehicle connector (supplying power to the electric vehicle). (625) (CMP-12)

Output Cable to the Primary Pad.

A multiconductor , shielded cable assembly consisting of conductors to carry the high-frequency energy and any status signals between the charger power converter and the primary pad. (625) (CMP-12)

Overcurrent.

Any current in excess of the rated current of equipment or the ampacity of a conductor. It may result from overload, short circuit, or ground fault. (CMP-10)

Informational Note: A current in excess of rating may be accommodated by certain equipment and conductors for a given set of conditions. Therefore, the rules for overcurrent protection are specific for particular situations.

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

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

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)

Overcurrent Protective Device, Supplementary. (Supplementary Overcurrent Protective 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. (CMP-10)

Overhead Gantry.

A structure consisting of horizontal framework, supported by vertical columns spanning above electrified truck parking spaces, that supports equipment, appliances, raceway, and other necessary components for the purpose of supplying electrical, HVAC, internet, communications, and other services to the spaces. (626) (CMP-12)

Overload.

Operation of equipment in excess of normal, full-load rating, or of a conductor in excess of its ampacity that, when it persists for a sufficient length of time, would cause damage or dangerous overheating. A fault, such as a short circuit or ground fault, is not an overload. (CMP-10)

Packaged Therapeutic Tub or Hydrotherapeutic Tank Equipment Assembly.

A factory-fabricated unit consisting of water-circulating, heating, and control equipment mounted on a common base, intended to operate a therapeutic tub or hydrotherapeutic tank. Equipment can include pumps, air blowers, heaters, lights, controls, sanitizer generators, and so forth. (680) (CMP-17)

Panelboard.

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

Panelboard, Enclosed. (Enclosed Panelboard)

An assembly of buses and connections, overcurrent devices, and control apparatus with or without switches or other equipment, installed in a suitable cabinet, cutout box, or enclosure suitable for a panelboard application. (CMP-1)

Park Electrical Wiring Systems.

All of the electrical wiring, luminaires, equipment, and appurtenances related to electrical installations within a mobile home park, including the mobile home service equipment. (550) (CMP-7)

Park Trailer.

A unit that is built on a single chassis mounted on wheels and has a gross trailer area not exceeding 37 m^2 (400 ft^2) in the set-up mode. (552) (CMP-7)

Part-Winding Motors.

A part-winding start induction or synchronous motor is one that is arranged for starting by first energizing part of its primary (armature) winding and, subsequently, energizing the remainder of this winding in one or more steps. A standard part-winding start induction motor is arranged so that one-half of its primary winding can be energized initially, and, subsequently, the remaining half can be energized, both halves then carrying equal current. (CMP 11)

Informational Note: A hermetic refrigerant motor-compressor is not considered a standard part-winding start induction motor.

Patient Bed Location.

The location of a patient sleeping bed, or the bed or procedure table of a Category 1 space. [**99:** 3.3.138] (CMP-15)

Patient Care–Related Electrical Equipment.

Electrical equipment appliance that is intended to be used for diagnostic, therapeutic, or monitoring purposes in a patient care vicinity. [**99:** 3.3.139] (517) (CMP-15)

Patient Care Space.

Any space of a health care facility wherein patients are intended to be examined or treated. [**99:** 3.3.140] (517) (CMP-15)

Informational Note No. 1: The health care facility's governing body designates patient care space in accordance with the type of patient care anticipated.

Informational Note No. 2: Business offices, corridors, lounges, day rooms, dining rooms, or similar areas typically are not classified as patient care spaces. [**99:** A.3.3.140]

Category 1 Space (as applied to patient care space).

Space in which failure of equipment or a system is likely to cause major injury or death of patients, staff, or visitors. [**99:** 3.3.140.1] (CMP-15)

Informational Note: These spaces, formerly known as critical care rooms, are typically where patients are intended to be subjected to invasive procedures and connected to line-operated, patient care–related appliances. Examples include, but are not limited to, special care patient rooms used for critical care, intensive care, and special care treatment rooms such as angiography laboratories, cardiac catheterization laboratories, delivery rooms, operating rooms, post-anesthesia care units, trauma rooms, and other similar rooms. [**99:** A.3.3.140.1]

Category 2 Space (as applied to patient care space).

Space in which failure of equipment or a system is likely to cause minor injury to patients, staff, or visitors. [**99:** 3.3.140.2] (CMP-15)

Informational Note: These spaces were formerly known as general care rooms. Examples include, but are not limited to, inpatient bedrooms, dialysis rooms, in vitro fertilization rooms, procedural rooms, and similar rooms. [**99:** A.3.3.140.2]

Category 3 Space (as applied to patient care space).

Space in which the failure of equipment or a system is not likely to cause injury to patients, staff, or visitors but can cause discomfort. [**99:** 3.3.140.3] (517) (CMP-15)

Informational Note: These spaces, formerly known as basic care rooms, are typically where basic medical or dental care, treatment, or examinations are performed. Examples include, but are not limited to, examination or treatment rooms in clinics, medical and dental offices, nursing homes, and limited care facilities. [**99:** A.3.3.140.3]

Category 4 Space (as applied to patient care space).

Space in which failure of equipment or a system is not likely to have a physical impact on patient care. [**99:** 3.3.140.4] (517) (CMP-15)

Informational Note: These spaces were formerly known as support rooms. Examples of support spaces include, but are not limited to, anesthesia work rooms, sterile supply, laboratories, morgues, waiting rooms, utility rooms, and lounges. [**99:** A.3.3.140.4]

Patient Care Vicinity.

A space, within a location intended for the examination and treatment of patients, extending 1.8 m (6 ft) beyond the normal location of the bed, chair, table, treadmill, or other device that supports the patient during examination and treatment and extending vertically to 2.3 m (7 ft 6 in.) above the floor. [**99:** 3.3.141] (517) (CMP-15)

Patient Equipment Grounding Point.

A jack or terminal that serves as the collection point for redundant grounding of electric appliances serving a patient care vicinity or for grounding other items in order to eliminate electromagnetic interference problems. [**99:** 3.3.142] (517) (CMP-15)

Performance Area.

The stage and audience seating area associated with a temporary stage structure, whether indoors or outdoors, constructed of scaffolding, truss, platforms, or similar devices, that is used for the presentation of theatrical or musical productions or for public presentations. (520) (CMP-15)

Permanent Amusement Attraction.

A ride device, entertainment device, or a combination of both that is installed such that portability or relocation is impracticable. (522) (CMP-15)

Permanently Installed Decorative Fountains and Reflection Pools.

Those that are constructed in the ground, on the ground, or in a building in such a manner that the fountain cannot be readily disassembled for storage, whether or not served by electrical circuits of any nature. These units are primarily constructed for their aesthetic value and are not intended for swimming or wading. (680) (CMP-17)

Personnel Protection System (as applied to EVSE).

A system of personnel protection devices and constructional features that when used together provide protection against electric shock of personnel. (625) (CMP-12)

Photovoltaic (PV) Powered Sign.

A complete sign powered by solar energy consisting of all components and subassemblies for installation either as an off-grid stand-alone, on-grid interactive, or non-grid interactive system. (600) (CMP-18)

Photovoltaic (PV) System.

The total components, circuits, and equipment up to and including the PV system disconnecting means that, in combination, convert solar energy into electric energy. (CMP-4)

Pier.

A structure extending over the water and supported on a fixed foundation (fixed pier), or on flotation (floating pier), that provides access to the water. [**303:** 3.3.17] (CMP-7)

Pier, Fixed.

Pier constructed on a permanent, fixed foundation, such as on piles, that permanently establishes the elevation of the structure deck with respect to land. [**303:** 3.3.17.2] (CMP-7)

Pier, Floating.

Pier designed with inherent flotation capability that allows the structure to float on the water surface and rise and fall with water level changes. [**303:** 3.3.17.3] (CMP-7)

Pipe Organ Sounding Apparatus.

The sound-producing part of a pipe organ, including, but not limited to, pipes, chimes, bells, the pressurized air- (wind-) producing equipment (blower), associated controls, and power equipment. (CMP-12)

Informational Note: The pipe organ sounding apparatus is also referred to as the *pipe organ chamber* .

Phase, Manufactured. (Manufactured Phase)

The phase that originates at the phase converter and is not solidly connected to either of the single-phase input conductors. (CMP-13)

Phase Converter.

An electrical device that converts single-phase power to 3-phase electric power. (CMP-13)

Informational Note: Phase converters have characteristics that modify the starting torque and locked-rotor current of motors served, and consideration is required in selecting a phase converter for a specific load.

Phase Converter, Rotary. (Rotary-Phase Converter)

A device that consists of a rotary transformer and capacitor panel(s) that permits the operation of 3-phase loads from a single-phase supply. (455) (CMP-13)

Phase Converter, Static. (Static-Phase Converter)

A device without rotating parts, sized for a given 3-phase load to permit operation from a single-phase supply. (455) (CMP-13)

Pipeline.

A length of pipe including pumps, valves, flanges, control devices, strainers, and/or similar equipment for conveying fluids. (CMP-17)

Plenum.

A compartment or chamber to which one or more air ducts are connected and that forms part of the air distribution system. (CMP-3)

Plugging Box.

A dc device consisting of one or more 2-pole, 2-wire, nonpolarized, nongrounding-type receptacles intended to be used on dc circuits only. (530) (CMP-15)

Point of Entrance.

The point within a building at which the wire or cable emerges from an external wall, from the roof, or from a concrete floor slab. (CMP-16)

Point of Entrance (Point of Entrance Optical Fiber Cable).

The point within a building at which the optical fiber cable emerges from an external wall or from a concrete floor slab. (CMP-16)

Pool.

Manufactured or field-constructed equipment designed to contain water on a permanent or semipermanent basis and used for swimming, wading, immersion, or therapeutic purposes. (680) (CMP-17)

Pool, Immersion. (Immersion Pool)

A pool for ceremonial or ritual immersion of users, which is designed and intended to have its contents drained or discharged. (680) (CMP-17)

Pool, Permanently Installed Swimming, Wading, Immersion, and Therapeutic. (Permanently Installed Swimming, Wading, Immersion, and Therapeutic Pools)

Those that are constructed or installed in the ground or partially in the ground, and all pools installed inside of a building, whether or not served by electrical circuits of any nature. (680) (CMP-17)

Pool Cover, Electrically Operated.

Motor-driven equipment designed to cover and uncover the water surface of a pool by means of a flexible sheet or rigid frame. (680) (CMP-17)

Portable.

A device intended for indoor or outdoor use that is designed to be hand-carried from location to location, or easily transported without the use of other devices or equipment. (625) (CMP-12)

Portable (as applied to equipment).

Equipment that is actually moved or can easily be moved from one place to another in normal use. (680) (CMP-17)

Portable (as applied to nonmedical X-ray equipment).

X-ray equipment designed to be hand-carried. (660) (CMP-12)

Portable Equipment.

Equipment intended to be moved from one place to another. (530) (CMP-15)

Portable Equipment.

Equipment with electrical components suitable to be moved by a single person without mechanical aids. (511) (CMP-14)

Portable Equipment.

Equipment fed with portable cords or cables intended to be moved from one place to another. (520) (CMP-15)

Portable Power Distribution Unit.

A power distribution box containing receptacles and overcurrent devices. (520) (CMP-15)

Informational Note: See ANSI/UL 1640, *Portable Power-Distribution Equipment* , for information on portable power distribution units.

Portable Structures.

Units designed to be moved including, but not limited to, amusement rides, attractions, concessions, tents, trailers, trucks, and similar units. (525) (CMP-15)

Powder Filling "q".

Type of protection where electrical parts capable of igniting an explosive atmosphere are fixed in position and completely surrounded by filling material (glass or quartz powder) to prevent the ignition of an external explosive atmosphere. (505) (CMP-14)

Informational Note: See ANSI/UL 60079-5-2016, *Explosive Atmospheres — Part 5: Equipment protection by powder filling "q".*

Power-Limited Fire Alarm Circuit (PLFA).

A fire alarm circuit powered by a source that complies with the requirements of 760.121. (CMP-3)

Power-Supply Assembly.

The conductors, including ungrounded, grounded, and equipment grounding conductors, the connectors, attachment plug caps, and all other fittings, grommets, or devices installed for the purpose of delivering energy from the source of electrical supply to the distribution panel within the recreational vehicle. (551) (CMP-7)

Power-Supply Cord.

A length of flexible cord with an attachment plug at one end and individual cord conductors not terminated in a cord connector at the opposite end. (CMP-6)

Power-Supply Cord (as applied to EVSE).

An assembly consisting of an attachment plug and length of flexible cord that connects equipment to a receptacle. (625) (CMP-12)

Power and Control Tray Cable, Type TC.

A factory assembly of two or more insulated conductors, with or without associated bare or covered equipment grounding conductors, under a nonmetallic jacket. (CMP-6)

Power Outlet.

An enclosed assembly that may include receptacles, circuit breakers, fuseholders, fused switches, buses, and watt-hour meter mounting means; intended to supply and control power to mobile homes, recreational vehicles, park trailers, or boats or to serve as a means for distributing power required to operate mobile or temporarily installed equipment. (CMP-7)

Power Outlet, Marina.

An enclosed assembly that can include equipment such as receptacles, circuit breakers, fused switches, fuses, a watt-hour meter(s), panelboards, and monitoring means identified for marina use. [**303:** 3.3.13] (555) (CMP-7)

Power Production Equipment.

Electrical generating equipment supplied by any source other than a utility service, up to the source system disconnecting means. (CMP-4)

Informational Note: Examples of power production equipment include such items as generators, solar photovoltaic systems, and fuel cell systems.

Power Source Output Circuit.

The conductors between power production equipment and the service or other systems. (CMP-4)

Power Supply.

A Class 2 power supply connected between the branch-circuit power distribution system and the busbar low-voltage suspended ceiling power distribution system. (393) (CMP-18)

Power-Limited Tray Cable (PLTC).

A factory assembly of two or more insulated conductors rated at 300 volts, with or without associated bare or insulated equipment grounding conductors, under a nonmetallic jacket. (CMP-3)

Premises-Powered.

Using power provided locally from the premises. (CMP-16)

Premises Wiring (System).

Interior and exterior wiring, including power, lighting, control, and signal circuit wiring together with all their associated hardware, fittings, and wiring devices, both permanently and temporarily installed. This includes (a) wiring from the service point or power source to the outlets or (b) wiring from and including the power source to the outlets where there is no service point.

Such wiring does not include wiring internal to appliances, luminaires, motors, controllers, motor control centers, and similar equipment. (CMP-1)

Informational Note: Power sources include, but are not limited to, interconnected or stand-alone batteries, solar photovoltaic systems, other distributed generation systems, or generators.

Pressurized.

The process of supplying an enclosure with a protective gas with or without continuous flow at sufficient pressure to prevent the entrance of combustible dust or ignitible fibers/flyings. (CMP-14)

Pressurized Enclosure “p”.

Type of protection for electrical equipment that uses the technique of guarding against the ingress of the external atmosphere, which might be explosive, into an enclosure by maintaining a protective gas therein at a pressure above that of the external atmosphere. (CMP-14)

> Informational Note: See ANSI/UL-60079-2-2017, *Explosive Atmospheres — Part 2: Equipment protection by pressurized enclosures “p”.*

Pressurized Room “p”.

A room volume protected by pressurization and of sufficient size to permit the entry of a person who might occupy the room. (CMP-14)

> Informational Note: See ANSI/UL 60079-13-2020, *Explosive Atmospheres — Part 13: Equipment protection by pressurized room “p” and artificially ventilated room “v”* , for requirements for rooms intended for human entry where pressurization is used as a means of reducing the risk of explosion.

Primary DC Source.

A source that supplies the majority of the dc load in a dc microgrid. (712) (CMP-13)

Primary Pad.

A device external to the EV that transfers power via the contactless coupling as part of a wireless power transfer system. (625) (CMP-12)

Primary Source.

An electric utility or another source of power that acts as the main forming and stabilizing source in an electric power system. (CMP-4)

Prime Mover.

The machine that supplies the mechanical horsepower to a generator. (CMP-13)

Premises.

The land and buildings of a user located on the user side of the utility-user network point of demarcation. (800) (CMP-16)

Process Seal.

A seal between electrical systems and flammable or combustible process fluids where a failure could allow the migration of process fluids into the premises’ wiring system. (CMP-14)

Professional-Type Projector.

A type of projector using 35- or 70-mm film that has a minimum width of 35 mm (1 3⁄8 in.) and has on each edge 212 perforations per meter (5.4 perforations per inch), or a type using carbon arc, xenon, or other light source equipment that develops hazardous gases, dust, or radiation. (540) (CMP-15)

Proscenium.

The wall and arch that separates the stage from the auditorium (i.e., house). (520) (CMP-15)

Protected Optical Fiber Cable.

Optical fiber cable protected from releasing optical radiation into the atmosphere during normal operating conditions and foreseeable malfunctions by additional armoring, conduit, cable tray, or raceway. (CMP-14)

> Informational Note: See ANSI/UL 60079-28-2017, *Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation* .

Protected Optical Radiation “op pr”.

Type of protection to minimize the risk of ignition in explosive atmospheres from optical radiation where visible or infrared radiation is confined inside optical fiber or other transmission medium under normal constructions or constructions with additional mechanical protection based on the assumption that there is no escape of radiation from the confinement. (CMP-14)

> Informational Note: See ANSI/UL 60079-28-2017, *Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation* .

Protection by Enclosure “t”.

Type of protection for explosive dust atmospheres where electrical equipment is provided with an enclosure providing dust ingress protection and a means to limit surface temperatures. (506) (CMP-14)

> Informational Note: See ANSI/UL 60079-31-2015, *Explosive Atmospheres — Part 31: Equipment Dust Ignition Protection by Enclosure “t”* , for additional information.

Psychiatric Hospital.

A building used exclusively for the psychiatric care, on a 24-hour basis, of four or more inpatients. (517) (CMP-15)

Purged and Pressurized.

The process of (1) purging, supplying an enclosure with a protective gas at a sufficient flow and positive pressure to reduce the concentration of any flammable gas or vapor initially present to an acceptable level; and (2) pressurization, supplying an enclosure with a protective gas with or without continuous flow at sufficient pressure to prevent the entrance of a flammable gas or vapor, a combustible dust, or an ignitible fiber. (CMP-14)

> Informational Note: See NFPA 496-2021, *Standard for Purged and Pressurized Enclosures for Electrical Equipment* , for additional information.

PV DC Circuit, Source. (PV Source Circuit)

The dc circuit conductors between modules in a PV string circuit, and from PV string circuits to dc combiners, electronic power converters, or a dc PV system disconnecting means. (690) (CMP-4)

PV DC Circuit, String. (PV String Circuit)

The PV source circuit conductors of one or more series-connected PV modules. (690) (CMP-4)

PV DC Circuit (PV System DC Circuit).

Any dc conductor in PV source circuits, PV string circuits, and PV dc-to-dc converter circuits. (690) (CMP-4)

Qualified Person.

One who has skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training to recognize and avoid the hazards involved. (CMP-1)

Informational Note: Refer to *NFPA 70E* -2018, *Standard for Electrical Safety in the Workplace* , for electrical safety training requirements.

Raceway.

An enclosed channel designed expressly for holding wires, cables, or busbars, with additional functions as permitted in this *Code* . (CMP-8)

Informational Note: A raceway is identified within specific article definitions.

Raceway, Cellular Metal Floor. (Cellular Metal Floor Raceway)

The hollow spaces of cellular metal floors, together with suitable fittings, that may be approved as enclosed channel for electrical conductors. (CMP-8)

Raceway, Communications. (Communications Raceway)

An enclosed channel of nonmetallic materials designed expressly for holding communications wires and cables; optical fiber cables; data cables associated with information technology and communications equipment; Class 2, Class 3, and Type PLTC cables; and power-limited fire alarm cables in plenum, riser, and general-purpose applications. (CMP-16)

Raceway, Strut-Type Channel. (Strut-Type Channel Raceway)

A metal raceway that is intended to be mounted to the surface of or suspended from a structure, with associated accessories for the installation of electrical conductors and cables. (CMP-8)

Raceway, Surface Metal. (Surface Metal Raceway)

A metal raceway that is intended to be mounted to the surface of a structure, with associated couplings, connectors, boxes, and fittings for the installation of electrical conductors. (CMP-8)

Raceway, Surface Nonmetallic. (Surface Nonmetallic Raceway)

A nonmetallic raceway that is intended to be mounted to the surface of a structure, with associated couplings, connectors, boxes, and fittings for the installation of electrical conductors. (CMP-8)

Raceway, Underfloor. (Underfloor Raceway)

A raceway and associated components designed and intended for installation beneath or flush with the surface of a floor for the installation of cables and electrical conductors. (CMP-8)

Rainproof.

Constructed, protected, or treated so as to prevent rain from interfering with the successful operation of the apparatus under specified test conditions. (CMP-1)

Raintight.

Constructed or protected so that exposure to a beating rain will not result in the entrance of water under specified test conditions. (CMP-1)

Rail.

The structural support for the suspended ceiling system typically forming the ceiling grid supporting the ceiling tile and listed utilization equipment, such as sensors, actuators, A/V devices, and low-voltage luminaires and similar electrical equipment. (393) (CMP-18)

Rated-Load Current (RLC) (as applied to air-conditioning and refrigerating equipment).

The current of a hermetic refrigerant motor-compressor resulting when it is operated at the rated load, rated voltage, and rated frequency of the equipment it serves. (440) (CMP-11)

Rated Output Power.

The amplifier manufacturer's stated or marked output power capability into its rated load. (640) (CMP-12)

Rated Power.

The output power of a wind turbine at its rated wind speed. (694) (CMP-4)

Informational Note: The method for measuring wind turbine power output is specified in IEC 61400-12-1, *Power Performance Measurements of Electricity Producing Wind Turbines* .

Receptacle.

A contact device installed at the outlet for the connection of an attachment plug, or for the direct connection of electrical utilization equipment designed to mate with the corresponding contact device. A single receptacle is a single contact device with no other contact device on the same yoke or strap. A multiple receptacle is two or more contact devices on the same yoke or strap. (CMP-18)

Informational Note: A duplex receptacle is an example of a multiple receptacle that has two receptacles on the same yoke or strap.

Receptacle, Weight Supporting Ceiling (WSCR).

A contact device installed at the outlet box for the connection and support of luminaries and paddle fans using a weight supporting attachment fitting (WASF). (CMP-18)

Receptacle Outlet.

An outlet where one or more receptacles are installed. (CMP-18)

Reconditioned.

Electromechanical systems, equipment, apparatus, or components that are restored to operating conditions. This process differs from normal servicing of equipment that remains within a facility, or replacement of listed equipment on a one-to-one basis. (CMP-10)

Informational Note: The term *reconditioned* is frequently referred to as *rebuilt* , *refurbished* , or *remanufactured* .

Recreational Vehicle.

A vehicle or slide-in camper that is primarily designed as temporary living quarters for recreational, camping, or seasonal use; has its own motive power or is mounted on or towed by another vehicle; is regulated by the National Highway Traffic Safety Administration as a vehicle or vehicle equipment; does not require a special highway use permit for operation on the highways; and can be easily transported and set up on a daily basis by an individual. [**1192:** 3.3.53] (551) (CMP-7)

Informational Note: The basic entities are travel trailer, camping trailer, truck camper, and motor home as referenced in NFPA 1192-2021, *Standard on Recreational Vehicles* . See 3.3.52, *Recreational Vehicle* , and A.3.3.52 of NFPA 1192.

Recreational Vehicle Park.

Any parcel or tract of land under the control of any person, organization, or governmental entity wherein two or more recreational vehicle, recreational park trailer, and/or other camping sites are offered for use by the public or members of an organization for overnight stays. (551) (CMP-7)

Recreational Vehicle Site.

A specific area within a recreational vehicle park or campground that is set aside for use by a camping unit. (551) (CMP-7)

Recreational Vehicle Site Supply Equipment.

The necessary equipment, usually a power outlet, consisting of a circuit breaker or switch and fuse and their accessories, located near the point of entrance of supply conductors to a recreational vehicle site and intended to constitute the disconnecting means for the supply to that site. (551) (CMP-7)

Recreational Vehicle Stand.

That area of a recreational vehicle site intended for the placement of a recreational vehicle. (551) (CMP-7)

Reference Grounding Point.

The ground bus of the panelboard or isolated power system panel supplying the patient care room. [**99:** 3.3.158] (517) (CMP-15)

Relative Analgesia.

A state of sedation and partial block of pain perception produced in a patient by the inhalation of concentrations of nitrous oxide insufficient to produce loss of consciousness (conscious sedation). (517) (CMP-15)

Relay, Automatic Load Control (Automatic Load Control Relay).

An emergency lighting control device used to set normally dimmed or normally-off switched emergency lighting equipment to full power illumination levels in the event of a loss of the normal supply by bypassing the dimming/switching controls, and to return the emergency lighting equipment to normal status when the device senses the normal supply has been restored. (700) (CMP-13)

Informational Note: See ANSI/UL 924, Emergency Lighting and Power Equipment, for the requirements covering automatic load control relays.

Remote-Control Circuit, Branch Circuit.

A branch circuit that controls any other branch circuit through a relay or an equivalent device. (CMP-3)

Remote-Control Circuit, Power-Limited.

Any power-limited electrical circuit that controls any other circuit through a relay or an equivalent device. (CMP-3)

Remote Disconnect Control.

An electric device and circuit that controls a disconnecting means through a relay or equivalent device. (645) (CMP-12)

Resistance Heating Element.

A specific separate element to generate heat that may be externally attached to, embedded in, integrated with, or internal to the object to be heated. (CMP-17)

Informational Note: Tubular heaters, strip heaters, heating cable, heating tape, heating blankets, immersion heaters, and heating panels are examples of resistance heaters.

Retrofit Kit.

A general term for a complete subassembly of parts and devices for field conversion of utilization equipment. (CMP-18)

Retrofit Kit, General Use.

A kit consisting of primary parts, which does not include all the parts for a complete subassembly but includes a list of required parts and installation instructions to complete the subassembly in the field. (600) (CMP-18)

Retrofit Kit, Sign Specific.

A kit consisting of the necessary parts and hardware to allow for field installation in a host sign, based on the included installation instructions. (600) (CMP-18)

Reverse Polarity Protection (Backfeed Protection).

A system that prevents two interconnected power supplies, connected positive to negative, from passing current from one power source into a second power source. (393) (CMP-18)

Ride Device.

A device or combination of devices that carry, convey, or direct a person(s) over or through a fixed or restricted course within a defined area for the primary purpose of amusement or entertainment. (522) (CMP-15)

Safe Zone (as applied to capacitors).

Low probability of damage other than a slight swelling of the capacitor case, as identified by the case rupture curve of the capacitor. (460) (CMP-11)

Safety Circuit.

The part of a control system containing one or more devices that perform a safety-related function. [**79:** 3.3.95] (670) (CMP-12)

Informational Note: See NFPA 79-2021, *Electrical Standard for Industrial Machinery. Safety-related control system* and *safety interlock circuit* are common terms that can be used to refer to the safety circuit in other standards. The safety circuit can include hard-wired, communication, and software-related components.

Sealable Equipment.

Equipment enclosed in a case or cabinet that is provided with a means of sealing or locking so that live parts cannot be made accessible without opening the enclosure. (CMP-1)

Informational Note: The equipment may or may not be operable without opening the enclosure.

Sealed [as applied to hazardous (classified) locations].

Constructed such that equipment is sealed effectively against entry of an external atmosphere and is not opened during normal operation or for any maintenance activities. (CMP-14)

Informational Note: See ANSI/UL 121201-2017, *Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations* , for additional information.

Section Sign.

A sign or outline lighting system, shipped as subassemblies, that requires field-installed wiring between the subassemblies to complete the overall sign. The subassemblies are either physically joined to form a single sign unit or are installed as separate remote parts of an overall sign. (600) (CMP-18)

Selected Receptacles.

A minimal number of receptacles selected by the health care facility's governing body as necessary to provide essential patient care and facility services during loss of normal power. [**99:** 3.3.164] (517) (CMP-15)

Self-Contained Therapeutic Tubs or Hydrotherapeutic Tanks.

A factory-fabricated unit consisting of a therapeutic tub or hydrotherapeutic tank with all water-circulating, heating, and control equipment integral to the unit. Equipment may include pumps, air blowers, heaters, light controls, sanitizer generators, and so forth. (680) (CMP-17)

Separable Power Supply Cable Assembly.

A flexible cord or cable, including ungrounded, grounded, and equipment grounding conductors, provided with a cord connector, an attachment plug, and all other fittings, grommets, or devices installed for the purpose of delivering energy from the source of electrical supply to the truck or TRU flanged surface inlet. (626) (CMP-12)

Separately Derived System.

An electrical power supply output, other than a service, having no direct connection(s) to circuit conductors of any other electrical source other than those established by grounding and bonding connections. (CMP-5)

Service.

The conductors and equipment connecting the serving utility to the wiring system of the premises served. (CMP-10)

Service Cable.

Service conductors made up in the form of a cable. (CMP-10)

Service Conductors.

The conductors from the service point to the service disconnecting means. (CMP-10)

Service Conductors, Overhead. (Overhead Service Conductors)

The overhead conductors between the service point and the first point of connection to the service-entrance conductors at the building or other structure. (CMP-10)

Service Conductors, Underground. (Underground Service Conductors)

The underground conductors between the service point and the first point of connection to the service-entrance conductors in a terminal box, meter, or other enclosure, inside or outside the building wall. (CMP-10)

Informational Note: Where there is no terminal box, meter, or other enclosure, the point of connection is considered to be the point of entrance of the service conductors into the building.

Service Drop.

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

Service-Entrance Cable.

A single conductor or multiconductor cable provided with an overall covering, primarily used for services, and of the following types:

Type SE.

Service-entrance cable having a flame-retardant, moisture-resistant covering.

Type USE.

Service-entrance cable, identified for underground use, having a moisture-resistant covering, but not required to have a flame-retardant covering.

(CMP-6)

Service-Entrance Conductor Assembly.

Multiple single-insulated conductors twisted together without an overall covering, other than an optional binder intended only to keep the conductors together. (CMP-6)

Service-Entrance Conductors, Overhead System.

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

Service-Entrance Conductors, Underground System.

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

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

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)

Service Equipment, Mobile Home. (Mobile Home Service Equipment)

The equipment containing the disconnecting means, overcurrent protective devices, and receptacles or other means for connecting a mobile home feeder assembly. (550) (CMP-7)

Service Lateral.

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

Service Point.

The point of connection between the facilities of the serving utility and the premises wiring. (CMP-10)

Informational Note: The service point can be described as the point of demarcation between where the serving utility ends and the premises wiring begins. The serving utility generally specifies the location of the service point based on the conditions of service.

Servicing.

The process of following a manufacturer's set of instructions to analyze, adjust, or perform prescribed actions upon equipment with the intention to preserve or restore the operational performance of the equipment. (CMP-1)

Informational Note: Servicing often encompasses maintenance and repair activities.

Shore Power.

The electrical equipment required to power a floating vessel including, but not limited to, the receptacle and cords. (555) (CMP-7)

Shoreline.

The farthest extent of standing water under the applicable conditions that determine the electrical datum plane for the specified body of water. (682) (CMP-17)

Short Circuit.

An abnormal connection (including an arc) of relatively low impedance, whether made accidentally or intentionally, between two or more points of different potential. (CMP-10)

Short-Circuit Current Rating.

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

Show Window.

Any window, including windows above doors, used or designed to be used for the display of goods or advertising material, whether it is fully or partly enclosed or entirely open at the rear and whether or not it has a platform raised higher than the street floor level. (CMP-2)

Sign Body.

A portion of a sign that may provide protection from the weather but is not an electrical enclosure. (600) (CMP-18)

Signaling Circuit, Branch Circuit.

Any branch circuit that energizes signaling equipment. (CMP-3)

Signaling Circuit, Power-Limited.

Any power-limited electrical circuit that energizes signaling equipment. (CMP-3)

Simple Apparatus.

An electrical component or combination of components of simple construction with well-defined electrical parameters that does not generate more than 1.5 volts, 100 mA, and 25 mW, or a passive component that does not dissipate more than 1.3 watts and is compatible with the intrinsic safety of the circuit in which it is used. (CMP-14)

Informational Note No. 1: The following are examples of simple apparatus:

(1) Passive components; for example, switches, instrument connectors, plugs and sockets, junction boxes, resistance temperature devices, and simple semiconductor devices such as LEDs

(2) Sources of stored energy consisting of single components in simple circuits with well-defined parameters; for example, capacitors or inductors, whose values are considered when determining the overall safety of the system

(3) Sources of generated energy; for example, thermocouples and photocells, that do not generate more than 1.5 volts, 100 mA, and 25 mW

Informational Note No. 2: See ANSI/UL 913-2013, *Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous (Classified) Locations* ; and ANSI/UL 60079-11-2013, *Explosive Atmospheres — Part 11: Equipment Protection by Intrinsic Safety "i"* , for additional information.

Single-Pole Separable Connector.

A device that is installed at the ends of portable, flexible, single-conductor cable that is used to establish connection or disconnection between two cables or one cable and a single-pole, panel-mounted separable connector. (CMP-18)

Site-Isolating Device.

A disconnecting means installed at the distribution point for the purposes of isolation, system maintenance, emergency disconnection, or connection of optional standby systems. (547) (CMP-7)

Skeleton Tubing.

Neon tubing that is itself the sign or outline lighting and is not attached to an enclosure or sign body. (600) (CMP-18)

Slip.

A berthing space between or adjacent to piers, wharves, or docks; the water areas associated with boat occupation. *(See also Berth.)* [**303:** 3.3.20] (555) (CMP-7)

Solar Cell.

The basic PV device that generates electricity when exposed to light. (CMP-4)

Solid-State Phase-Control Dimmer.

A solid-state dimmer where the wave shape of the steady-state current does not follow the wave shape of the applied voltage such that the wave shape is nonlinear. (CMP-15)

Solid-State Sine Wave Dimmer.

A solid-state dimmer where the wave shape of the steady-state current follows the wave shape of the applied voltage such that the wave shape is linear. (CMP-15)

Spa or Hot Tub.

A hydromassage pool, or tub for recreational or therapeutic use, not located in health care facilities, designed for immersion of users, and usually having a filter, heater, and motor-driven blower. It may be installed indoors or outdoors, on the ground or supporting structure, or in the ground or supporting structure. Generally, a spa or hot tub is not designed or intended to have its contents drained or discharged after each use. (680) (CMP-17)

Spa or Hot Tub, Packaged Equipment Assembly (Packaged Spa or Hot Tub Equipment Assembly).

A factory-fabricated unit consisting of water-circulating, heating, and control equipment mounted on a common base, intended to operate a spa or hot tub. Equipment can include pumps, air blowers, heaters, lights, controls, sanitizer generators, and so forth. (680) (CMP-17)

Spa or Hot Tub, Self-Contained (Self-Contained Spa or Hot Tub).

Factory-fabricated unit consisting of a spa or hot tub vessel with all water-circulating, heating, and control equipment integral to the unit. Equipment can include pumps, air blowers, heaters, lights, controls, sanitizer generators, and so forth. (680) (CMP-17)

Space.

A portion of the health care facility designated by the health care facility's governing body that serves a specific purpose. [**99:** 3.3.171] (517) (CMP-15)

Special Permission.

The written consent of the authority having jurisdiction. (CMP-1)

Special Protection “s”.

Type of protection that permits design, assessment, and testing of equipment that cannot be fully assessed within a recognized type of protection or combination of recognized types of protection because of functional or operational limitations, but that can be demonstrated to provide the necessary equipment protection level (EPL).

Informational Note No. 1: Special protection “s” under the Zone system is equivalent in concept to other protection techniques under the Division system as described in 500.7(U).

Informational Note No. 2: Type of protection “s” is only intended for equipment that is outside the scope of other ANSI/UL 60079 series type of protection standards.

Special-Purpose Multi-Circuit Cable System.

A portable branch-circuit distribution system consisting of one or more trunk cables and optional breakout assemblies or multi-circuit outlet enclosures. (520) (CMP-15)

Spider (Cable Splicing Block).

A device that contains busbars that are insulated from each other for the purpose of splicing or distributing power to portable cables and cords that are terminated with single-pole busbar connectors. (530) (CMP-15)

Spin Down.

A shutdown condition of the FESS, where energy is being dissipated and the flywheel rotor is slowing down to a stop. (706) (CMP-13)

Informational Note: A complete stop of a flywheel rotor cannot occur instantaneously because of the high kinetic energy of the rotor, but rather occurs over time as a result of friction forces acting on the rotor.

Splash Pad.

A fountain intended for recreational use by pedestrians and designed to contain no more than 25 mm (1 in.) of water depth. This definition does not include showers intended for hygienic rinsing prior to use of a pool, spa, or other water feature. (680) (CMP-17)

Spray Area.

Any fully enclosed, partly enclosed, or unenclosed area in which dangerous quantities of flammable or combustible vapors, mists, residues, dusts, or deposits are present due to the operation of spray processes, including (1) any area in the direct path of a spray application process; (2) the interior of a spray booth, spray room, or limited finishing workstation, as herein defined; (3) the interior of any exhaust plenum, eliminator section, or scrubber section; (4) the interior of any exhaust duct or exhaust stack leading from a spray application process; (5) the interior of any air recirculation path up to and including recirculation particulate filters; (6) any solvent concentrator (pollution abatement) unit or solvent recovery (distillation) unit; and (7) the inside of a membrane enclosure. The following are not part of the spray area: (1) fresh air make-up units; (2) air supply ducts and air supply plenums; (3) recirculation air supply ducts downstream of recirculation particulate filters; and (4) exhaust ducts from solvent concentrator (pollution abatement) units. [**33:** 3.3.2.3] (516) (CMP-14)

Informational Note: Unenclosed spray areas are locations outside of buildings or are localized operations within a larger room or space. Such areas are normally provided with some local vapor extraction/ventilation system. In automated operations, the area limits are the maximum area in the direct path of spray operations. In manual operations, the area limits are the maximum area of spray when aimed at 90 degrees to the application surface.

Spray Booth.

A power-ventilated enclosure for a spray application operation or process that confines and limits the escape of the material being sprayed, including vapors, mists, dusts, and residues that are produced by the spraying operation and conducts or directs these materials to an exhaust system. [**33:** 3.3.19] (516) (CMP-14)

Informational Note: A spray booth is an enclosure or insert within a larger room used for spraying, coating, and/or dipping applications. A spray booth can be fully enclosed or have open front or face and can include a separate conveyor entrance and exit. The spray booth is provided with a dedicated ventilation exhaust with supply air from the larger room or from a dedicated air supply.

Spray Room.

A power-ventilated fully enclosed room used exclusively for open spraying of flammable or combustible materials. [**33:** 3.3.16] (516) (CMP-14)

Stage Effect (Special Effect).

An electrical or electromechanical piece of equipment used to simulate a distinctive visual or audible effect, such as a wind machine, lightning simulator, or sunset projector. (CMP-15)

Stage Equipment.

Equipment at any location on the premises integral to the stage production including, but not limited to, equipment for lighting, audio, special effects, rigging, motion control, projection, or video. (520) (CMP-15)

Stage Lighting Hoist.

A motorized lifting device that contains a mounting position for one or more luminaires, with wiring devices for connection of luminaires to branch circuits, and integral flexible cables to allow the luminaires to travel over the lifting range of the hoist while energized. (520) (CMP-15)

Stage Property.

An article or object used as a visual element in a motion picture or television production, except painted backgrounds (scenery) and costumes. (530) (CMP-15)

Stage Set.

A specific area set up with temporary scenery and properties designed and arranged for a particular scene in a motion picture or television production. (CMP-15)

Stage Switchboard.

A permanently installed switchboard, panelboard, or rack containing dimmers or relays with associated overcurrent protective devices, or overcurrent protective devices alone, used primarily to feed stage equipment. (CMP-15)

Stage Switchboard, Portable.

A portable rack or pack containing dimmers or relays with associated overcurrent protective devices, or overcurrent protective devices alone used to feed stage equipment. (520) (CMP-15)

Stand Lamp (Work Light).

A portable stand that contains a general-purpose luminaire or lampholder with guard for the purpose of providing general illumination on the stage or in the auditorium. (CMP-15)

Stand Lamp (Work Light).

A portable stand that contains a general-purpose luminaire or lampholder with guard for the purpose of providing general illumination in the studio or stage. (530) (CMP-15)

Stand-Alone System.

A system that is not connected to an electric power production and distribution network. (CMP-4)

Stationary (as applied to equipment).

Equipment that is not moved from one place to another in normal use. (680) (CMP-17)

Storable Swimming, Wading, or Immersion Pools and Storable/Portable Spas and Hot Tubs.

Swimming, wading, or immersion pools and spas and hot tubs installed fully on or above the ground that are intended to be stored when not in use designed for ease of relocation. (680) (CMP-17)

> Informational Note: Historically, a 1.07 m (42 in.) wall height accommodated most storable swimming pools. Modern manufacturing methods have allowed storable pool manufacturers to increase wall heights while still permitting ease of assembly and disassembly of the pool.

Storage, Dry Stack.

A facility, either covered or uncovered, constructed of horizontal and vertical structural members designed to allow placement of small boats in defined slots arranged both horizontally and vertically. [**303:** 3.3.23.2] (555) (CMP-7)

Stored-Energy Power Supply System (SEPSS).

This definition shall apply within this article and throughout the code. A complete functioning EPSS powered by a stored-energy electrical source. (CMP-13)

Strip Light.

A luminaire with multiple lamps arranged in a row. (520) (CMP-15)

Structure.

That which is built or constructed, other than equipment. (CMP-1)

Structure, Relocatable. (Relocatable Structure)

A factory-assembled structure or structures transportable in one or more sections that are built on a permanent chassis and designed to be used as other than a dwelling unit without a permanent foundation. (545) (CMP-7)

> Informational Note: Examples of relocatable structures are those units that are equipped for sleeping purposes only, contractor's and other on-site offices, construction job dormitories, studio dressing rooms, banks, clinics, stores, shower facilities and restrooms, training centers, or for the display or demonstration of merchandise or machines.

Subassembly.

Component parts or a segment of a sign, retrofit kit, or outline lighting system that, when assembled, forms a complete unit or product. (600) (CMP-18)

Substation.

An assemblage of equipment (e.g., switches, interrupting devices, circuit breakers, buses, and transformers) through which electric energy is passed for the purpose of distribution, switching, or modifying its characteristics. (CMP-9)

Supervised Industrial Installation.

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

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

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

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

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

Supervisory Control and Data Acquisition (SCADA).

An electronic system that provides monitoring and controls for the operation of the critical operations power system. This can include the fire alarm system, security system, control of the HVAC, the start/stop/monitoring of the power supplies and electrical distribution system, annunciation and communications equipment to emergency personnel, facility occupants, and remote operators. (CMP-13)

Surge Arrester.

A protective device for limiting surge voltages by discharging or bypassing surge current; it also prevents continued flow of follow current while remaining capable of repeating these functions. (CMP-10)

Surge-Protective Device (SPD).

A protective device for limiting transient voltages by diverting or limiting surge current; it also prevents continued flow of follow current while remaining capable of repeating these functions and is designated as follows:

(1) Type 1: Permanently connected SPDs intended for installation between the secondary of the service transformer and the line side of the service disconnect overcurrent device

(2) Type 2: Permanently connected SPDs intended for installation on the load side of the service disconnect overcurrent device, including SPDs located at the branch panel

(3) Type 3: Point of utilization SPDs

(4) Type 4: Component SPDs, including discrete components, as well as assemblies. (CMP-10)

Informational Note: See UL 1449, *Standard for Surge Protective Devices*, for further information on SPDs.

Suspended Ceiling Grid.

A system that serves as a support for a finished ceiling surface and other utilization equipment. (393) (CMP-18)

Switch, Bypass Isolation.

A manual, nonautomatic, or automatic operated device used in conjunction with a transfer switch to provide a means of directly connecting load conductors to a power source and of disconnecting the transfer switch. (CMP-13)

Switch, General-Use. (General-Use Switch)

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

Switch, General-Use Snap. (General-Use Snap Switch)

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

Switch, Isolating. (Isolating Switch)

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

Switch, Meter-Mounted Transfer. (Meter-Mounted Transfer Switch)

A transfer switch connected between the utility meter and the meter base or fabricated as part of the meter base. (CMP-13)

Informational Note: Meter-mounted transfer switches can plug into the meter base or be fabricated as part of the meter base. Transfer switches that incorporate the meter base in the transfer equipment assembly are not considered meter-mounted transfer switches.

Switch, Motor-Circuit.

A switch rated in horsepower that is capable of interrupting the maximum operating overload current of a motor of the same horsepower rating as the switch at the rated voltage. (CMP-11)

Switch, Transfer.

An automatic or nonautomatic device for transferring one or more load conductor connections from one power source to another. (CMP-13)

Switchboard.

A large single panel, frame, or assembly of panels on which are mounted on the face, back, or both, switches, overcurrent and other protective devices, buses, and usually instruments. These assemblies are generally accessible from the rear as well as from the front and are not intended to be installed in cabinets. (CMP-9)

Switchgear.

An assembly completely enclosed on all sides and top with sheet metal (except for ventilating openings and inspection windows) and containing primary power circuit switching, interrupting devices, or both, with buses and connections. The assembly may include control and auxiliary devices. Access to the interior of the enclosure is provided by doors, removable covers, or both. (CMP-9)

Informational Note: All switchgear subject to *NEC* requirements is metal enclosed. Switchgear rated below 1000 V or less may be identified as “low-voltage power circuit breaker switchgear.” Switchgear rated over 1000 V may be identified as “metal-enclosed switchgear” or “metal-clad switchgear.” Switchgear is available in non–arc-resistant or arc-resistant constructions.

Switching Device.

A device designed to close, open, or both, one or more electrical circuits. (CMP-1)

Cutout.

An assembly of a fuse support with either a fuseholder, fuse carrier, or disconnecting blade. The fuseholder or fuse carrier may include a conducting element (fuse link) or may act as the disconnecting blade by the inclusion of a nonfusible member.

Disconnecting (or Isolating) Switch (Disconnector, Isolator).

A mechanical switching device used for isolating a circuit or equipment from a source of power.

Interrupter Switch.

A switch capable of making, carrying, and interrupting specified currents.

Oil Cutout (Oil-Filled Cutout).

A cutout in which all or part of the fuse support and its fuse link or disconnecting blade is mounted in oil with complete immersion of the contacts and the fusible portion of the conducting element (fuse link) so that arc interruption by severing of the fuse link or by opening of the contacts will occur under oil.

Oil Switch.

A switch having contacts that operate under oil (or askarel or other suitable liquid).

Regulator Bypass Switch.

A specific device or combination of devices designed to bypass a regulator.

System Isolation Equipment (as applied to motors).

A redundantly monitored, remotely operated contactor-isolating system, packaged to provide the disconnection/isolation function, capable of verifiable operation from multiple remote locations by means of lockout switches, each having the capability of being padlocked in the “off” (open) position. (430) (CMP-11)

Tap Conductor.

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

Task Illumination.

Provisions for the minimum lighting required to carry out necessary tasks in the areas described in 517.34(A), including safe access to supplies and equipment and access to exits. [**99:** 3.3.177] (517) (CMP-15)

Technical Power System.

An electrical distribution system where the equipment grounding conductor is isolated from the premises grounded conductor and the premises equipment grounding conductor except at a single grounded termination point within a branch-circuit panelboard, at the originating (main breaker) branch-circuit panelboard or at the premises grounding electrode. (640) (CMP-12)

Television Studio or Motion Picture Stage (Sound Stage).

A building or portion of a building usually insulated from the outside noise and natural light for use by the entertainment industry for the purpose of motion picture, television, or commercial production. (530) (CMP-15)

Temporary Equipment.

Portable wiring and equipment intended for use with events of a transient or temporary nature where all equipment is presumed to be removed at the conclusion of the event. (640) (CMP-12)

Terminal (as applied to batteries).

That part of a cell, container, or battery to which an external connection is made (commonly identified as post, pillar, pole, or terminal post). (CMP-13)

Thermal Protector (as applied to motors).

A protective device for assembly as an integral part of a motor or motor-compressor that, when properly applied, protects the motor against dangerous overheating due to overload and failure to start. (CMP-11)

Informational Note: The thermal protector may consist of one or more sensing elements integral with the motor or motor-compressor and an external control device.

Thermal Resistivity.

The heat transfer capability through a substance by conduction. (CMP-6)

Informational Note: Thermal resistivity is the reciprocal of thermal conductivity and is designated Rho, which is expressed in the units °C-cm/W.

Thermally Protected (as applied to motors).

A motor or motor-compressor that is provided with a thermal protector. (CMP-11)

Top Shield, Type FCC.

A grounded metal shield covering under-carpet components of the FCC system for the purposes of providing protection against physical damage. (324) (CMP-6)

Tower (as applied to wind electric systems).

A pole or other structure that supports a wind turbine. (694) (CMP-4)

Trailer, Camping. (Camping Trailer)

A vehicular portable unit mounted on wheels and constructed with collapsible partial side walls that fold for towing by another vehicle and unfold at the campsite to provide temporary living quarters for recreational, camping, or travel use. *(See Recreational Vehicle.)* (551) (CMP-7)

Transfer Switch, Branch-Circuit Emergency Lighting (Branch-Circuit Emergency Lighting Transfer Switch).

A device connected on the load side of a branch-circuit overcurrent protective device that transfers only emergency lighting loads from the normal power source to an emergency power source. (700) (CMP-13)

Informational Note: See ANSI/UL 1008, Transfer Switch Equipment, for information covering branch-circuit emergency lighting transfer switches.

Transformer.

An individual transformer, single- or polyphase, identified by a single nameplate, unless otherwise indicated in this article. (CMP-9)

Transition Assembly, Type FCC.

An assembly to facilitate connection of the FCC system to other wiring systems, incorporating (1) a means of electrical interconnection and (2) a suitable box or covering for providing electrical safety and protection against physical damage. (324) (CMP-6)

Transport Refrigerated Unit (TRU).

A trailer or container, with integrated cooling or heating, or both, used for the purpose of maintaining the desired environment of temperature-sensitive goods or products. (626) (CMP-12)

Transportable (as applied to nonmedical X-ray equipment).

X-ray equipment that is to be installed in a vehicle or that may be readily disassembled for transport in a vehicle. (660) (CMP-12)

Travel Trailer.

A vehicular unit, mounted on wheels, designed to provide temporary living quarters for recreational, camping, or travel use, of such size or weight as not to require special highway movement permits when towed by a motorized vehicle, and of gross trailer area less than 30 m^2 (320 ft^2). *(See Recreational Vehicle.)* (551) (CMP-7)

Truck.

A motor vehicle designed for the transportation of goods, services, and equipment. (626) (CMP-12)

Truck Camper.

A portable unit constructed to provide temporary living quarters for recreational, travel, or camping use, consisting of a roof, floor, and sides, designed to be loaded onto and unloaded from the bed of a pickup truck. *(See Recreational Vehicle.)* (551) (CMP-7)

Truck Coupler.

A truck flanged surface inlet and mating cord connector. (626) (CMP-12)

Truck Flanged Surface Inlet.

The device(s) on the truck into which the connector(s) is inserted to provide electric energy and other services. This device is part of the truck coupler. For the purposes of this article, the truck flanged surface inlet is considered to be part of the truck and not part of the electrified truck parking space supply equipment. (626) (CMP-12)

Trunk Cable.

A portable extension cable containing six or more branch circuits, a male multipole plug, and a female multipole receptacle. (520) (CMP-15)

Tubing, Electrical Metallic (EMT). (Electrical Metallic Tubing)

An unthreaded thinwall raceway of circular cross section designed for the physical protection and routing of conductors and cables and for use as an equipment grounding conductor when installed utilizing appropriate fittings. (CMP-8)

Tubing, Electrical Nonmetallic (ENT). (Electrical Nonmetallic Tubing)

A nonmetallic, pliable, corrugated raceway of circular cross section with integral or associated couplings, connectors, and fittings for the installation of electrical conductors. ENT is composed of a material that is resistant to moisture and chemical atmospheres and is flame retardant.

A pliable raceway is a raceway that can be bent by hand with a reasonable force but without other assistance. (CMP-8)

Tubing, Flexible Metallic (FMT). (Flexible Metallic Tubing)

A metal raceway that is circular in cross section, flexible, and liquidtight without a nonmetallic jacket. (CMP-8)

Two-Fer.

An assembly containing one male plug and two female cord connectors used to connect two loads to one branch circuit. (520) (CMP-15)

Type of Protection “n”.

Type of protection where electrical equipment, in normal operation, is not capable of igniting a surrounding explosive gas atmosphere and a fault capable of causing ignition is not likely to occur. (505) (CMP-14)

> Informational Note: See ANSI/UL 60079-15-2013, *Explosive Atmospheres — Part 15: Equipment Protection by Type of Protection “n”.*

Unclassified Locations.

Locations determined to be neither Class I, Division 1; Class I, Division 2; Zone 0; Zone 1; Zone 2; Class II, Division 1; Class II, Division 2; Class III, Division 1; Class III, Division 2; Zone 20; Zone 21; Zone 22; nor any combination thereof. (CMP-14)

Underground Feeder and Branch-Circuit Cable, Type UF.

A factory assembly of one or more insulated conductors with an integral or an overall covering of nonmetallic material suitable for direct burial in the earth. (CMP-6)

Unenclosed Spray Area.

Any spray area that is not confined by a limited finishing workstation, spray booth, or spray room, as herein defined. [**33:** 3.3.2.3.2] (516) (CMP-14)

Ungrounded.

Not connected to ground or to a conductive body that extends the ground connection. (CMP-5)

Uninterruptible Power Supply (UPS).

A device or system that provides quality and continuity of ac power through the use of a stored-energy device as the backup power source for a period of time when the normal power supply is incapable of performing acceptably. (CMP-13)

Unit Equipment.

A battery-equipped emergency luminaire that illuminates only as part of the emergency illumination system and is not illuminated when the normal supply is available. (CMP-13)

Utilization Equipment.

Equipment that utilizes electric energy for electronic, electromechanical, chemical, heating, lighting, or similar purposes. (CMP-1)

Valve Actuator Motor (VAM) Assemblies.

A manufactured assembly, used to operate a valve, consisting of an actuator motor and other components such as motor controllers, torque switches, limit switches, and overload protection. (430) (CMP-11)

Informational Note: VAMs typically have short-time duty and high-torque characteristics.

Ventilated.

Provided with a means to permit circulation of air sufficient to remove an excess of heat, fumes, or vapors. (CMP-14)

Vessel.

A container such as a barrel, drum, or tank for holding fluids or other material. (CMP-17)

Volatile Flammable Liquid.

A flammable liquid having a flash point below 38°C (100°F), or a flammable liquid whose temperature is above its flash point, or a Class II combustible liquid that has a vapor pressure not exceeding 276 kPa (40 psia) at 38°C (100°F) and whose temperature is above its flash point. (CMP-14)

Voltage (of a circuit).

The greatest root-mean-square (rms) (effective) difference of potential between any two conductors of the circuit concerned. (CMP-1)

Informational Note: Some systems, such as 3-phase 4-wire, single-phase 3-wire, and 3-wire direct current, may have various circuits of various voltages.

Voltage, Nominal.

A nominal value assigned to a circuit or system for the purpose of conveniently designating its voltage class (e.g., 120/240 volts, 480Y/277 volts, 600 volts). (CMP-1)

Informational Note No. 1: The actual voltage at which a circuit operates can vary from the nominal within a range that permits satisfactory operation of equipment.

Informational Note No. 2: See ANSI C84.1-2011, *Voltage Ratings for Electric Power Systems and Equipment (60 Hz).*

Voltage, Nominal. (Nominal Voltage)

A value assigned to a circuit or system for the purpose of conveniently designating its dc voltage class. (712) (CMP-13)

Informational Note: The actual voltage at which a circuit operates can vary from the nominal voltage within a range that permits satisfactory operation of equipment.

Voltage to Ground.

For grounded circuits, the voltage between the given conductor and that point or conductor of the circuit that is grounded; for ungrounded circuits, the greatest voltage between the given conductor and any other conductor of the circuit. (CMP-1)

Watertight.

Constructed so that moisture will not enter the enclosure under specified test conditions. (CMP-1)

Weatherproof.

Constructed or protected so that exposure to the weather will not interfere with successful operation. (CMP-1)

Informational Note: Rainproof, raintight, or watertight equipment can fulfill the requirements for weatherproof where varying weather conditions other than wetness, such as snow, ice, dust, or temperature extremes, are not a factor.

Wet Procedure Location.

The area in a patient care space where a procedure is performed that is normally subject to wet conditions while patients are present, including standing fluids on the floor or drenching of the work area, either of which condition is intimate to the patient or staff. [**99:** 3.3.187] (517) (CMP-15)

Informational Note: Routine housekeeping procedures and incidental spillage of liquids do not define a wet procedure location. [**99:** A.3.3.187]

Wharf.

A structure at the shoreline that has a platform built along and parallel to a body of water with either an open deck or a superstructure. [**307:** 3.3.24] (555) (CMP-7)

Wind Turbine.

A mechanical device that converts wind energy to electrical energy. (CMP-4)

Wind Turbine Output Circuit.

The circuit conductors between the internal components of a wind turbine (which might include an alternator, integrated rectifier, controller, and/or inverter) and other equipment. (694) (CMP-4)

Wire.

A factory assembly of one or more insulated conductors without an overall covering. (805) (CMP-16)

Wireless Power Transfer (WPT).

The transfer of electrical energy from a power source to an electrical load via magnetic fields by a contactless means between a primary device and a secondary device. (625) (CMP-12)

Wireless Power Transfer Equipment (WPTE).

Equipment comprising the conductors, including the ungrounded, grounded, and equipment grounding conductors, personnel protection system, power and control electronics, communication electronics, the output cable to the primary pad, the primary pad and all other fittings, devices, power outlets, or apparatus installed specifically for the purpose of transferring energy between the premises wiring and the electric vehicle without physical electrical contact. (625) (CMP-12)

Informational Note No. 1: The general form of WPTE consists of two physical packages: a control box and a primary pad.

Informational Note No. 2: Electric vehicle power export equipment and wireless power transfer equipment are sometimes contained in one set of equipment, sometimes referred to as a bidirectional WPTE.

Wireways, Metal. (Metal Wireways)

Sheet metal troughs with hinged or removable covers for housing and protecting electrical wires and cable and in which conductors are laid in place after the raceway has been installed as a complete system. (CMP-8)

Wireways, Nonmetallic. (Nonmetallic Wireways)

Flame-retardant, nonmetallic troughs with removable covers for housing and protecting electrical wires and cables in which conductors are laid in place after the raceway has been installed as a complete system. (CMP-8)

Zone.

A physically identifiable area (such as barriers or separation by distance) within an information technology equipment room, with dedicated power and cooling systems for the information technology equipment or systems. (645) (CMP-12)

Statement of Problem and Substantiation for Public Comment

Accept the definition proposed by Mr. Leblanc, for reason of shock protection. If the first floor of a house, or an entire one-story home, is below grade, it may be reasonable to treat the lowest level as being grounded much as a basement, and thus posing higher shock risk. While this certainly won't be true in all cases, the expansion of GFCI protection to all parts of a basement reflected in part the need to cover the riskier cases. This is a more important consideration than its inclusion or exclusion in the count of number of stories.

I'll give you a concrete example. My neighborhood has a lot of split-ranch houses, slab-built. Their walk-in lower levels are sometimes, but not always, treated as basements, utility areas. When we bought our house, that was the layout: up one flight to the kitchen and bedrooms. We brought those downstairs, like quite a few of our neighbors, treating most of the first level as the main first floor. Here's what we found.

We wanted to glue cork down on the concrete slab to make a more comfortable walking surface in that first level, as well as the cork adding some thermal insulation. We couldn't: measuring, we found too much moisture percolated up through the concrete. Instead, we put down ceramic tile in that downstairs dining room, bathroom, bedroom, and office. Even though we weren't using most of it as a basement in the usual sense, from an electrical standpoint its floor was close to an unfinished basement in terms of grounding and associated risk of electrocution.

Related Item

• PI 951

Submitter Information Verification

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Submittal Date:	Mon Aug 02 22:01:23 EDT 2021
Committee:	NEC-P02

Public Comment No. 1501-NFPA 70-2021 [Section No. 210.1]

210.1 Scope.

This article provides the general requirements for branch circuits.

~~Informational Note: For requirements that supplement or modify this article for over 1000 Vac, 1500 Vdc installations, see Article 235.~~

Statement of Problem and Substantiation for Public Comment

There is no new Article 235 because the public input was resolved. This should have been addressed by the Correlating Committee in a manner that correlates with the action by CMP-10 to resolve PI

Related Item

- FR 9180

Submitter Information Verification

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Submittal Date: Sun Aug 15 16:25:23 EDT 2021
Committee: NEC-P02

Public Comment No. 282-NFPA 70-2021 [Section No. 210.1]

210.1 Scope.

This article provides the general requirements for branch circuits not more than 1000 Vac or 1500 Vdc .

Informational Note: For general requirements ~~that supplement or modify this article for~~ for branch circuits over 1000 Vac, 1500 Vdc installations, see Article 235.

Statement of Problem and Substantiation for Public Comment

This public comment is submitted on behalf of a correlating committee CMP 2 task group formulated to create a new Article 235 to cover requirements for branch circuits over 1000 Vac and 15000 Vdc. This task group consists of the following members: Thomas Domitrovich, Paul Barnhart, David Williams, Alan Manche, Mike Querry, Kevin Rogers, Roger McDaniel, Rod Belisle.

This comment aligns the scope of Article 210 with the scope of new Article 235. New Article 235 includes all requirements for branch circuits over 1000 Vac and 15000 Vdc and does not suppliment or amend the requirements found in Article 210.

Related Item

- FR 9180

Submitter Information Verification

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Submittal Date: Mon Jul 19 18:48:09 EDT 2021
Committee: NEC-P02

Public Comment No. 635-NFPA 70-2021 [Section No. 210.1]

210.1 Scope.

This article provides the general requirements for branch circuits.

Informational Note: For requirements that supplement or modify this article for over 1000 Vac, 1500 Vdc installations, see Article 235.

Additional Proposed Changes

File Name	Description	Approved
2_CN_385.pdf	2 CN385	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 385 appeared in the First Draft Report on First Revision Nos. 9180, 9208 and 9298.

The Correlating Committee accepts the action taken by CMP 2 to remove branch circuit requirements for circuits operating above 1000 volts (FR's 9180 (210.1), 9208 (210.6), and 9298 (210.19)). The Correlating Committee directs that CMP 2 form a Task Group, including representation from "medium voltage" experts as needed, to create a new Article 235 to cover requirements for branch circuits over 1000 Volts ac, 1500 Volts de. This Task Group should also consider references to "over 600 volt" applications in Table 220.3, and correct those to reflect the new Article 235. Purview of this new Article will be determined after the Second Draft. The Correlating Committee refers this to CMP 9, 10 and 11 for comment.

Related Item

• First Revision No. 9180 • First Revision No. 9208 • First Revision No. 9298

Submitter Information Verification

Submitter Full Name:	CC on NEC-AAC
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Committee:	NEC-P02

Correlating Committee Note No. 385-NFPA 70-2021 [Section No. 210.1]

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Fri May 07 14:34:50 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee accepts the action taken by CMP 2 to remove branch circuit requirements for circuits operating above 1000 volts (FR's 9180 (210.1), 9208 (210.6), and 9298 (210.19)). The Correlating Committee directs that CMP 2 form a Task Group, including representation from "medium voltage" experts as needed, to create a new Article 235 to cover requirements for branch circuits over 1000 Volts ac, 1500 Volts dc. This Task Group should also consider references to "over 600 volt" applications in Table 220.3, and correct those to reflect the new Article 235. Purview of this new Article will be determined after the Second Draft. The Correlating Committee refers this to CMP 9, 10 and 11 for comment.

First Revision No. 9180-NFPA 70-2021 [Section No. 210.1]

First Revision No. 9208-NFPA 70-2021 [Section No. 210.6]

First Revision No. 9298-NFPA 70-2021 [Section No. 210.19]

Ballot Results

✔ **This item has passed ballot**

12 Eligible Voters
0 Not Returned
10 Affirmative All
0 Affirmative with Comments
2 Negative with Comments
0 Abstention

Affirmative All

Ayer, Lawrence S.

Gallo, Ernest J.

Holub, Richard A.

Hunter, Dean C.

Kendall, David H.

Kovacik, John R.

Manche, Alan

McDaniel, Roger D.

Porter, Christine T.

Williams, David A.

Negative with Comment

Hickman, Palmer L.

The Correlating Committee has improperly weighed in on a technical issue on which it does not have jurisdiction as it has not been the Technical Correlating Committee for several years now. The Correlating Committee should have followed the guidance of Code Panel 2 in its committee statement to FR-9180 that the Correlation Committee states that it agrees with in CN-38, states that "…existing panels could be expanded to include members with medium-voltage expertise" if the Correlating Committee conducted adequate research and determined that the members of Code Panel 2 does not possess the requisite medium voltage expertise to conduct it work with a degree of confidence. While I do not necessarily believe this to be the case, this is quite troubling that the 2023 edition and several previous editions of the NEC are being developed through a consensus process without the benefit of decisions being made by those that are deemed to be qualified to do so by both the Code Panel doing the work and the Correlating Committee. It is also worth noting that this was not a unanimous vote to take this action. For example, Fred Neubauer, in his negative ballot statement correctly pointed out that "[t]his First Revision should be resolved as proposed Article 235 (under the responsibility of CMP-10) was overwhelmingly resolved and therefore is nonexistent" and that "[t]he Correlating Committee will ultimately have to report these as resolved" and that "[t]he actions by CMP-2 on First Revisions 9208, 9202, and 9180 are totally presumptuous and perceived as an effort to steer the Code development process." I am in agreement that the correct action to correlate is to correlate this this with the Panel 10 resolve which did not create a new Article 235. Further perplexing is that the "Correlating Committee directs that CMP 2 form a Task Group, including representation from "medium voltage" experts as needed, to create a new Article 235 to cover requirements for branch circuits over 1000 Volts ac, 1500 Volts dc." It does not seem logical to direct a Code Panel that the Correlating Committee deems to lack medium voltage expertise to be the entity that will identify those that are "experts" in medium voltage. I am also puzzled as to why "[p]urview of this new Article will be determined after the Second Draft." I do not understand the logic of waiting until after the 2023 NEC has developed to determine what group of "experts" or "non-experts" has purview over medium voltage requirements.

Johnston, Michael J.

This negative ballot reflects organizational positioning. It makes no sense to develop a separate Article 235 for relocating three sections from existing Article 210. As clearly indicated in the negative ballot statements on the many resolved public inputs and first revisions related to the medium voltage issues, this NEC Correlating Committee effectively dealt with these issues in the 1990s resulting in the current NEC structure. The proposed changes by this TG are not from the public. In fact, there were no public inputs indicating any problems related to this issue in the past several development cycles of the NEC. This is a solution that is in search of a problem that does not exist. The majority of these proposed public inputs were overwhelmingly resolved by the majority of Code panels. That disposition cannot be ignored. It is clear that the proposed revisions are nothing more than moving things around in the NEC, which negatively impacts usability rather than helps it. The claims about users not being able to find the information under the existing NEC structure are NOT indicative of a problem with the NEC, it is a sign of a need for more training. These proposed revisions will not fix a lack of training in the NEC. Even as the Correlating Committee met to review the work of the Code Panels, it was clear that most of this effort could not even meet the NEC Style Manual requirements that indicate articles must be about a specific topic. CMP-10 overwhelmingly opposed this and resolved PI 3819. NECA remains in opposition to these highly impactful revisions and maintains that the current NEC structure is not broken. A review of the first revisions that were created (by CMP-3 and 9) will reveal that the NEC is being broken by this effort, unfortunately. There was no technical substantiation for these changes and no evidence of a problem with the current structure of the Code. Those that do not know or understand the history are bound to repeat it. The unnecessary damage being created by these unsubstantiated revisions is going to result in significant work to restore the NEC structure.

Public Comment No. 7-NFPA 70-2021 [Section No. 210.4(A)]

(A) General.

Branch circuits recognized by this article shall be permitted as multiwire circuits. A multiwire circuit shall be permitted to be considered as multiple circuits. All conductors of a multiwire branch circuit shall originate from the equipment containing the branch-circuit overcurrent protective device<u>(s)</u> .

Informational Note No. 1: A 3-phase, 4-wire, wye-connected power system used to supply power to nonlinear loads might necessitate that the power system design allow for the possibility of high harmonic currents on the neutral conductor.

Informational Note No. 2: See 300.13(B) for continuity of grounded conductors on multiwire circuits.

Statement of Problem and Substantiation for Public Comment

The use of handle ties is permitted for multiwire branch circuits so the language should allow for a branch circuit protective device or for branch circuit protective devices.

Related Item

- FR-8788

Submitter Information Verification

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Submittal Date:	Tue Jun 29 11:49:44 EDT 2021
Committee:	NEC-P02

Public Comment No. 1519-NFPA 70-2021 [Section No. 210.6]

210.6 Branch-Circuit Voltage Limitations.

The nominal voltage of branch circuits shall not exceed the values permitted by 210.6(A) through (D).

(A) Occupancy Limitation.

In dwelling units and guest rooms or guest suites of hotels, motels, and similar occupancies, the voltage shall not exceed 120 volts, nominal, between conductors that supply the terminals of the following:

(1) Luminaires

(2) Cord-and-plug-connected loads 1440 volt-amperes, nominal, or less or less than ¼ hp

(B) 120 Volts Between Conductors.

Circuits not exceeding 120 volts, nominal, between conductors shall be permitted to supply the following:

(1) The terminals of lampholders applied within their voltage ratings

(2) Auxiliary equipment of electric-discharge lamps

Informational Note: See 410.137 for auxiliary equipment limitations.

(3) Cord-and-plug-connected or permanently connected utilization equipment

(C) 277 Volts to Ground.

Circuits exceeding 120 volts, nominal, between conductors and not exceeding 277 volts, nominal, to ground shall be permitted to supply cord-and-plug-connected or permanently connected utilization equipment, or the following types of listed luminaires:

(1) Electric-discharge luminaires with integral ballasts

(2) LED luminaires with LED drivers between the branch circuit and the lampholders

(3) Incandescent or LED luminaires, equipped with medium-base or smaller screw shell lampholders, where the lampholders are supplied at 120 volts or less from the output of a stepdown autotransformer, LED driver, or other type of power supply that is an integral component of the luminaire

Informational Note No. 1: See 410.90 for requirements regarding the connection of screw shell lampholders to grounded conductors.

(4) Luminaires equipped with mogul-base screw shell lampholders

(5) Luminaires equipped with lampholders, other than the screw shell type, when used within the voltage ratings of their lampholders

(6) Luminaires without lampholders

Informational Note No. 2: Luminaires with nonserviceable LEDs are examples of luminaires without lampholders.

(7) Auxiliary equipment of electric-discharge or LED-type lamps

Informational Note No. 3: See 410.137 for auxiliary equipment limitations.

(8) Luminaires converted with listed retrofit kits incorporating integral LED light sources or accepting LED lamps that also conform with 210.6(C)(1), (C)(2), (C)(3), (C)(4), or (C)(5)

(D) 1000 Volts Between Conductors.

Circuits exceeding 277 volts, nominal, to ground and not exceeding 1000 volts, nominal, between conductors shall be permitted to supply the following:

(1) The auxiliary equipment of electric-discharge lamps mounted in permanently installed luminaires where the luminaires are mounted in accordance with one of the following:

(2) Not less than a height of 6.7 m (22 ft) on poles or similar structures for the illumination of outdoor areas such as highways, roads, bridges, athletic fields, or parking lots

(3) Not less than a height of 5.5 m (18 ft) on other structures such as tunnels

Informational Note: See 410.137 for auxiliary equipment limitations.

(4) Cord-and-plug-connected or permanently connected utilization equipment other than luminaires

(5) Luminaires powered from direct-current systems where either of the following apply:

(6) The luminaire contains a listed, dc-rated ballast that provides isolation between the dc power source and the lamp circuit and protection from electric shock when changing lamps.

(7) The luminaire contains a listed, dc-rated ballast and has no provision for changing lamps.

Exception No. 1 to (B), (C), and (D): For lampholders of infrared industrial heating appliances as provided in 425.14.

Exception No. 2 to (B), (C), and (D): For railway properties as described in 110.19.

(E) *Over 1000 Volts Between Conductors.*

Circuits exceeding 600 volts, nominal, between conductors shall be permitted to supply utilization equipment in installations where conditions of maintenance and supervision ensure that only qualified persons service the installation.

Statement of Problem and Substantiation for Public Comment

It is not logical and makes no sense to develop a completely new article to contain 2 sections dealing with branch circuits over 1000 volts. This does not enhance usability or add clarity in any way, in addition, these sections were deleted in a presumptuous manner anticipating a new article will be created.

Related Item

• FR 9208

Submitter Information Verification

Submitter Full Name: Agnieszka Golriz
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Submittal Date: Mon Aug 16 09:14:54 EDT 2021
Committee: NEC-P02

Public Comment No. 283-NFPA 70-2021 [Section No. 210.6(D)]

(D) 1000 Volts ac or 1500 Volts dc Between Conductors.

Circuits exceeding 277 volts, nominal, to ground and not exceeding 1000 volts ac or 1500 volts dc , nominal, between conductors shall be permitted to supply the following:

(1) The auxiliary equipment of electric-discharge lamps mounted in permanently installed luminaires where the luminaires are mounted in accordance with one of the following:

(2) Not less than a height of 6.7 m (22 ft) on poles or similar structures for the illumination of outdoor areas such as highways, roads, bridges, athletic fields, or parking lots

(3) Not less than a height of 5.5 m (18 ft) on other structures such as tunnels

Informational Note: See 410.137 for auxiliary equipment limitations.

(4) Cord-and-plug-connected or permanently connected utilization equipment other than luminaires

(5) Luminaires powered from direct-current systems where either of the following apply:

(6) The luminaire contains a listed, dc-rated ballast that provides isolation between the dc power source and the lamp circuit and protection from electric shock when changing lamps.

(7) The luminaire contains a listed, dc-rated ballast and has no provision for changing lamps.

Exception No. 1 to (B), (C), and (D): For lampholders of infrared industrial heating appliances as provided in 425.14.

Exception No. 2 to (B), (C), and (D): For railway properties as described in 110.19.

Statement of Problem and Substantiation for Public Comment

This public comment is submitted on behalf of a correlating committee CMP 2 task group formulated to create a new Article 235 to cover requirements for branch circuits over 1000 Vac and 15000 Vdc. This task group consists of the following members: Thomas Domitrovich, Paul Barnhart, David Williams, Alan Manche, Mike Querry, Kevin Rogers, Roger McDaniel, Rod Belisle. This comment adds both 1000 Vac and 1500 Vdc to ensure alignment with the scope of Article 235.

Related Item

- FR 9208

Submitter Information Verification

Submitter Full Name: Thomas Domitrovich
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City:
State:
Zip:
Submittal Date: Mon Jul 19 18:57:40 EDT 2021
Committee: NEC-P02

Public Comment No. 749-NFPA 70-2021 [Section No. 210.7]

210.7 Multiple Branch Circuits.

~~Where~~ If two or more branch circuits supply devices or equipment on the same yoke or mounting strap, or in a multigang box without a divider acceptable to the Authority Having Jurisdiction separating them, a means to simultaneously disconnect the ungrounded supply conductors shall be provided at the point at which the branch circuits originate.

Statement of Problem and Substantiation for Public Comment

If a box is adequately compartmentalized, simultaneous disconnection may be unnecessary.
I trust this wording resolves the concerns of both Mr. Rochon and the CMP.

Related Item

- PI 3073

Submitter Information Verification

Submitter Full Name:	David Shapiro
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City:	
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Submittal Date:	Tue Aug 03 18:10:43 EDT 2021
Committee:	NEC-P02

Public Comment No. 1296-NFPA 70-2021 [Section No. 210.8]

210.8 Ground-Fault Circuit-Interrupter Protection for Personnel.

A listed Class A GFCI shall provide protection in accordance with 210.8(A) through (F). The GFCI shall be installed in a readily accessible location.

Informational Note No. 1: See 215.9 for GFCI protection on feeders.

Informational Note No. 2: See 422.5(A) for GFCI requirements for appliances.

Informational Note No. 3: See 555.35(F) for GFCI requirements for boat hoists.

Informational Note No. 4: Additional GFCI requirements for specific circuits and equipment are contained in Chapters 4, 5, and 6.

For the purposes of this section, the distance from receptacles shall be measured as the shortest path the power supply cord connected to the receptacle would follow without piercing a floor, wall, ceiling, or fixed barrier.

(A) Dwelling Units.

All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (A)(11) and supplied by single-phase branch circuits rated 150 volts or less to ground shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms

(2) Garages and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use

(3) Outdoors

(4) Crawl spaces — at or below grade level

(5) Basements

Informational Note: See 760.41(B) and 760.121(B) for power supply requirements for fire alarm systems.

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(6) Kitchens — where the receptacles are installed to serve the countertop surfaces

(7) Sinks — where receptacles are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink

(8) Boathouses

(9) Bathtubs or shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall

(10) Laundry areas

(11) Indoor damp and wet locations

Exception No. 1: Receptacles that are not readily accessible and are supplied by a branch circuit dedicated to electric snow-melting, deicing, or pipeline and vessel heating equipment shall be permitted to be installed in accordance with 426.28 or 427.22, as applicable.

Exception No. 2: A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

Exception No. 3: Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a general-purpose convenience receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(B) Other Than Dwelling Units.

All 125-volt through 250-volt receptacles supplied by single-phase branch circuits rated 150 volts or less to ground, 50 amperes or less, and all receptacles supplied by three-phase branch circuits rated 150 volts or less to ground, 100 amperes or less, installed in the following locations shall be provided with GFCI protection:

(1) Bathrooms

(2) Kitchens

(3) Areas with sinks and permanent provisions for food preparation, beverage preparation, or cooking

(4) Buffet serving areas with permanent provisions for food serving, beverage serving, or cooking

(5) Rooftops

Exception to (5): Receptacles on rooftops shall not be required to be readily accessible other than from the rooftop.

(6) Outdoors

(7) Sinks where receptacles or cord-and-plug-connected fixed and stationary appliances are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink

Exception No. 1 to (7): In industrial establishments only, where the conditions of maintenance and supervision ensure that only qualified personnel are involved, an assured equipment grounding conductor program in accordance with 590.6(B)(2) shall be permitted for only those receptacle outlets used to supply equipment that would create a greater hazard if power is interrupted or that has a design not compatible with GFCI protection.

Exception No. 2 to (7): In industrial laboratories, receptacles used to supply equipment where removal of power would introduce a greater hazard shall be permitted to be installed without GFCI protection.

Exception No. 3 to (7): Receptacles located in patient bed locations of Category 2 (general care) or Category 1 (critical care) spaces of health care facilities shall be permitted to comply with 517.21.

(8) Indoor damp or wet locations

(9) Locker rooms with associated showering facilities

(10) Garages, accessory buildings, service bays, and similar areas other than vehicle exhibition halls and showrooms

(11) Crawl spaces at or below grade level

(12) Unfinished areas of basements

Exception to (1) through (7), (10), and (12): Listed locking support and mounting receptacles used in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be GFCI protected. If a general-purpose convenience receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(13) Aquariums, bait wells, and similar open aquatic vessels or containers, such as tanks or bowls, where receptacles are installed within 1.8 m (6 ft.) from the top inside edge or rim or from the conductive support framing of the vessel or container

(14) Laundry areas

(15) Bathtubs and shower stalls where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall

Exception to (1) through (15): Receptacles that are not readily accessible and are supplied by a branch circuit dedicated to electric snow-melting, deicing, or pipeline and vessel heating equipment shall be permitted to be installed in accordance with 426.28 or 427.22, as applicable.

(C) Crawl Space Lighting Outlets.

GFCI protection shall be provided for lighting outlets not exceeding 120 volts installed in crawl spaces.

(D) Specific Appliances.

GFCI protection shall be provided for the branch circuit or outlet supplying the following appliances rated 150 volts or less to ground and 60 amperes or less, single- or 3-phase:

(1) Automotive vacuum machines

(2) Drinking water coolers and bottle fill stations

(3) Cord-and-plug-connected high-pressure spray washing machines

(4) Tire inflation machines

(5) Vending machines

(6) Sump pumps

(7) Dishwashers

(E) Equipment Requiring Servicing.

GFCI protection shall be provided for the receptacles required by 210.63.

(F) Outdoor Outlets.

For dwellings, all outdoor outlets rated 125 volts through 250 volts, including outlets installed in the following locations, and supplied by single-phase branch circuits rated 150 volts or less to ground, 50 amperes or less, shall be provided with GFCI protection:

(1) Garages that have floors located at or below grade level

(2) Accessory buildings

(3) All outdoor outlets for dwellings other than those covered in 210.8(A), Exception No. 1

(4) Boathouses

Where equipment supplied by an outlet covered under the requirements of this section is replaced, the outlet shall be supplied with GFCI protection.

Exception: GFCI protection shall not be required on lighting outlets other than those covered in 210.8(C).

Statement of Problem and Substantiation for Public Comment

I am not suggesting any changes to the existing language, but am rather asking CMP-2 to consider implementing an effective date of Jan. 1, 2026 to any major changes that occur to this section. The industry does not need another black eye like the one it received by adding 210.8(F) in the 2020 edition. The number of attempted (and, as of this date, successful) TIAs is evidence of the fact.

Related Item

- CI 8953

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Ryan Jackson
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City:
State:
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Submittal Date: Wed Aug 11 16:21:33 EDT 2021
Committee: NEC-P02

Public Comment No. 618-NFPA 70-2021 [Section No. 210.8]

210.8 Ground-Fault Circuit-Interrupter Protection for Personnel.

A listed Class A GFCI shall provide protection in accordance with 210.8(A) through (F). The GFCI shall be installed in a readily accessible location.

Informational Note No. 1: See 215.9 for GFCI protection on feeders.

Informational Note No. 2: See 422.5(A) for GFCI requirements for appliances.

Informational Note No. 3: See 555.35(F) for GFCI requirements for boat hoists.

Informational Note No. 4: Additional GFCI requirements for specific circuits and equipment are contained in Chapters 4, 5, and 6.

For the purposes of this section, the distance from receptacles shall be measured as the shortest path the power supply cord connected to the receptacle would follow without piercing a floor, wall, ceiling, or fixed barrier.

(A) Dwelling Units.

All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (A)(11) and supplied by single-phase branch circuits rated 150 volts or less to ground shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms

(2) Garages and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use

(3) Outdoors

(4) Crawl spaces — at or below grade level

(5) Basements

Informational Note: See 760.41(B) and 760.121(B) for power supply requirements for fire alarm systems.

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(6) Kitchens — where the receptacles are installed to serve the countertop surfaces

(7) Sinks — where receptacles are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink

(8) Boathouses

(9) Bathtubs or shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall

(10) Laundry areas

(11) Indoor damp and wet locations

Exception No. 1: Receptacles that are not readily accessible and are supplied by a branch circuit dedicated to electric snow-melting, deicing, or pipeline and vessel heating equipment shall be permitted to be installed in accordance with 426.28 or 427.22, as applicable.

Exception No. 2: A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

Exception No. 3: Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a general-purpose convenience receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(B) Other Than Dwelling Units.

All 125-volt through 250-volt receptacles supplied by single-phase branch circuits rated 150 volts or less to ground, 50 amperes or less, and all receptacles supplied by three-phase branch circuits rated 150 volts or less to ground, 100 amperes or less, installed in the following locations shall be provided with GFCI protection:

(1) Bathrooms

(2) Kitchens

(3) Areas with sinks and permanent provisions for food preparation, beverage preparation, or cooking

(4) Buffet serving areas with permanent provisions for food serving, beverage serving, or cooking

(5) Rooftops

Exception to (5): Receptacles on rooftops shall not be required to be readily accessible other than from the rooftop.

(6) Outdoors

(7) Sinks where receptacles or cord-and-plug-connected fixed and stationary appliances are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink

Exception No. 1 to (7): In industrial establishments only, where the conditions of maintenance and supervision ensure that only qualified personnel are involved, an assured equipment grounding conductor program in accordance with 590.6(B)(2) shall be permitted for only those receptacle outlets used to supply equipment that would create a greater hazard if power is interrupted or that has a design not compatible with GFCI protection.

Exception No. 2 to (7): In industrial laboratories, receptacles used to supply equipment where removal of power would introduce a greater hazard shall be permitted to be installed without GFCI protection.

Exception No. 3 to (7): Receptacles located in patient bed locations of Category 2 (general care) or Category 1 (critical care) spaces of health care facilities shall be permitted to comply with 517.21.

(8) Indoor damp or wet locations

(9) Locker rooms with associated showering facilities

(10) Garages, accessory buildings, service bays, and similar areas other than vehicle exhibition halls and showrooms

(11) Crawl spaces at or below grade level

(12) Unfinished areas of basements

Exception to (1) through (7), (10), and (12): Listed locking support and mounting receptacles used in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be GFCI protected. If a general-purpose convenience receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(13) Aquariums, bait wells, and similar open aquatic vessels or containers, such as tanks or bowls, where receptacles are installed within 1.8 m (6 ft.) from the top inside edge or rim or from the conductive support framing of the vessel or container

(14) Laundry areas

(15) Bathtubs and shower stalls where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall

Exception to (1) through (15): Receptacles that are not readily accessible and are supplied by a branch circuit dedicated to electric snow-melting, deicing, or pipeline and vessel heating equipment shall be permitted to be installed in accordance with 426.28 or 427.22, as applicable.

(C) Crawl Space Lighting Outlets.

GFCI protection shall be provided for lighting outlets not exceeding 120 volts installed in crawl spaces.

(D) Specific Appliances.

GFCI protection shall be provided for the branch circuit or outlet supplying the following appliances rated 150 volts or less to ground and 60 amperes or less, single- or 3-phase:

(1) Automotive vacuum machines

(2) Drinking water coolers and bottle fill stations

(3) Cord-and-plug-connected high-pressure spray washing machines

(4) Tire inflation machines

(5) Vending machines

(6) Sump pumps

(7) Dishwashers

(E) Equipment Requiring Servicing.

GFCI protection shall be provided for the receptacles required by 210.63.

(F) Outdoor Outlets.

For dwellings, all outdoor outlets rated 125 volts through 250 volts, including outlets installed in the following locations, and supplied by single-phase branch circuits rated 150 volts or less to ground, 50 amperes or less, shall be provided with GFCI protection:

(1) Garages that have floors located at or below grade level

(2) Accessory buildings

(3) All outdoor outlets for dwellings other than those covered in 210.8(A), Exception No. 1

(4) Boathouses

Where equipment supplied by an outlet covered under the requirements of this section is replaced, the outlet shall be supplied with GFCI protection.

Exception: GFCI protection shall not be required on lighting outlets other than those covered in 210.8(C).

Additional Proposed Changes

File Name	Description	Approved
2_CN_112.pdf	2_CN112	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 112 appeared in the First Draft Report on First Revisions No. 8804.

The Correlating Committee directs that the Panel consider reviewing the Informational Notes for parallel construction to comply with 3.3.5 of the NEC Style Manual.

Related Item

• First Revision No. 8804

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
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Zip:
Submittal Date: Mon Aug 02 14:16:10 EDT 2021
Committee: NEC-P02

Correlating Committee Note No. 112-NFPA 70-2021 [Section No. 210.8 [Excluding any Sub-Sections]]

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Tue May 04 13:47:17 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs that the Panel consider reviewing the Informational Notes for parallel construction to comply with 3.3.5 of the NEC Style Manual.

First Revision No. 8804-NFPA 70-2021 [Section No. 210.8 [Excluding any Sub-Sections]]

Ballot Results

✔ **This item has passed ballot**

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

Affirmative All

Ayer, Lawrence S.
Gallo, Ernest J.
Hickman, Palmer L.
Holub, Richard A.
Hunter, Dean C.
Johnston, Michael J.
Kendall, David H.
Kovacik, John R.
Manche, Alan
McDaniel, Roger D.
Porter, Christine T.
Williams, David A.

Public Comment No. 1126-NFPA 70-2021 [New Section after 210.8(A)]

TITLE OF NEW CONTENT

Exception No. 4: All factory-installed receptacle outlets mounted internal to bathroom exhaust fans shall not require GFCI protection unless required by the installation instructions or listing.

Statement of Problem and Substantiation for Public Comment

CMP-2 had already agreed to add this exception with the Panel Statement of, "A new exception No. 4 was added to provide clarity regarding factory installed receptacles internal to exhaust fans while directing the user to follow installation instructions. This receptacle located internal to the exhaust fan is not meant for public use as it is dedicated for the exhaust fan. In addition, this receptacle would not be required to have GFCI protection as per 90.7 due to the fact this is internal to the equipment."

This proposed exception was lumped into other proposed changes at 210.8(A) and for reasons not related to this proposed new exception No. 4 did not get the necessary 2/3 written ballot. Please do the general public a favor and do the right thing by adding this exception for an internal exhaust fan receptacle and don't let this simple exception get caught up in the political fighting of CMP-2.

The related PI is 3375 and the related Committee Input is 8953.

Related Item

• PI 3375 • CI 8953

Submitter Information Verification

Submitter Full Name:	L. Keith Lofland
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Submittal Date:	Mon Aug 09 16:48:17 EDT 2021
Committee:	NEC-P02

Public Comment No. 1343-NFPA 70-2021 [Section No. 210.8(A)]

(A) Dwelling Units.

All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (A)(11) and supplied by single-phase branch circuits rated 150 volts or less to ground shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms

(2) Garages and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use

(3) Outdoors

(4) Crawl spaces — at or below grade level

(5) Basements

Informational Note: See 760.41(B) and 760.121(B) for power supply requirements for fire alarm systems.

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(6) Kitchens — where the receptacles are installed to serve the countertop surfaces <u>and all outlets supplying ranges.</u>

(7) Sinks — where receptacles are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink

(8) Boathouses

(9) Bathtubs or shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall

(10) Laundry areas

(11) Indoor damp and wet locations

Exception No. 1: Receptacles that are not readily accessible and are supplied by a branch circuit dedicated to electric snow-melting, deicing, or pipeline and vessel heating equipment shall be permitted to be installed in accordance with 426.28 or 427.22, as applicable.

Exception No. 2: A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

Exception No. 3: Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a general-purpose convenience receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

Statement of Problem and Substantiation for Public Comment

This PI was resolved with a comment as unneeded since the a FR was created to provide GFCI for all 15 and 20V outlets. That FR was rejected during FD ballot. Therefore I am submitting this public comment to have this addition reconsidered. Also, the Association of Home Appliance Manufacturers (AHAM) has submitted a proposal to UL 858 to update the leakage current testing to include voltages above 120Vac. This proposal will provide correlation with the requirements for Class A GFIC's.

The addition of GFCI requirements for 240V outlets added in the 2020 NEC by CMP-2 were based the need to improve electrocution protection in response to several fatalities. One of these fatalities was an electrocution from a stove. CMP-2's discussion during the 2020 NEC development process did not reference the relationship to the sink only the electrocution hazard of the stove or range. Adding this load to the requirement for kitchens will make sure this protection is not put at risk.

As a reminder, the fatality that drove this requirement was a plumber in New Hampshire who backed into the stove while working and it electrocuted him. Since then an additional fatality can be linked to stove and stove outlets. It was a young boy in Ft. Myers, Fl who touched the outlet by reaching behind to get a toy and had nothing to do with the distance from the sink. This situation is similar the fatalities that occurred with the laundry dryer.
https://www.nbc-2.com/story/38472937/child-gets-shocked-after-touching-stove-outlet
https://www.youtube.com/watch?v=dFLhVg9z9Qs

Related Item

• Public Input No. 2817

Submitter Information Verification

Submitter Full Name: Keith Waters
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Affiliation: Schneider Electric
Street Address:
City:
State:
Zip:

Submittal Date:	Thu Aug 12 08:32:47 EDT 2021
Committee:	NEC-P02

Public Comment No. 1536-NFPA 70-2021 [Section No. 210.8(A)]

(A) Dwelling Units.

All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (A)(11) and supplied by single-phase branch circuits rated 150 volts or less to ground shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms

(2) Garages and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use

(3) Outdoors

(4) Crawl spaces — at or below grade level

(5) Basements

Informational Note: See 760.41(B) and 760.121(B) for power supply requirements for fire alarm systems.

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(6) Kitchens ~~— where the receptacles are installed to serve the countertop surfaces —~~

(7) Areas with sinks and permanent provisions for food preparation, beverage preparation, or cooking.

(8) Sinks — where receptacles are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink

(9) Boathouses

(10) Bathtubs or shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall

(11) Laundry areas

(12) Indoor damp and wet locations

Exception No. 1: Receptacles that are not readily accessible and are supplied by a branch circuit dedicated to electric snow-melting, deicing, or pipeline and vessel heating equipment shall be permitted to be installed in accordance with 426.28 or 427.22, as applicable.

Exception No. 2: A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

Exception No. 3: Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a general-purpose convenience receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

Statement of Problem and Substantiation for Public Comment

There are areas in dwellings and other than dwellings that have sinks and serve many of the functions of kitchens, but do not have permanent provisions for both food preparation and cooking. Whether there are permanent provisions for cooking or food preparation, the appliances and other equipment that are used are similar. These spaces generally have countertops, cabinets, and may have refrigeration equipment, dish washers, toasters, blenders, coffee makers, ovens, and present similar demands to the electrical system. Activities performed in areas with permanent provisions for food preparation or permanent provisions for cooking are similar (i.e., washing dishes, cooking/heating food, cutting and washing food).
It seems reasonable to require GFCI protection for areas that do not have both permanent provisions for food preparation and permanent provisions for cooking in homes based on the same reasoning for requiring this protection in other than dwellings. As described above, the equipment used in these areas are similar, the activities performed in these areas are similar, and there is a sink present. The demands placed on the electrical system depend on the equipment used, the use case and are agnostic to whether both permanent provisions for cooking and permanent provisions for food preparation are present in the room. Electrical hazards to people occupying the space are dependent on the activities that they are performing, the presences of moisture, and the equipment in their proximity (See committee statement from FR 8129-NFPA 70-2018).

Related Item

• PI2965/PI 3026/PI 3029

Submitter Information Verification

Submitter Full Name: Megan Hayes
Organization: Nema
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 16 12:08:48 EDT 2021
Committee: NEC-P02

Public Comment No. 159-NFPA 70-2021 [Section No. 210.8(A)]

(A) Dwelling Units.

All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (A)(11) and supplied by ~~single-phase~~ branch circuits rated 150 volts or less to ground shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms

(2) Garages and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use

(3) Outdoors

(4) Crawl spaces — at or below grade level

(5) Basements

Informational Note: See 760.41(B) and 760.121(B) for power supply requirements for fire alarm systems.

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(6) Kitchens — where the receptacles are installed to serve the countertop surfaces

(7) Sinks — where receptacles are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink

(8) Boathouses

(9) Bathtubs or shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall

(10) Laundry areas

(11) Indoor damp and wet locations

~~Exception No. 1~~ Exception to (3) : Receptacles that are not readily accessible and are supplied by a branch circuit dedicated to electric snow-melting, deicing, or pipeline and vessel heating equipment shall be permitted to be installed in accordance with 426.28 or 427.22, as applicable.

~~Exception No. 2~~ Exception to (5) : A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall ~~not be required to have~~ not have ground-fault circuit-interrupter protection.

~~Exception No. 3~~ Exception to 210.8(A) : Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of ~~serving a~~ supporting a ceiling luminaire or ceiling-suspended (paddle) fan shall not be required to be ground-fault circuit-interrupter protected. If a general-purpose convenience receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

Statement of Problem and Substantiation for Public Comment

"Single-phase" needs to be removed for clarity. Some branch circuits in or on dwellings can be supplied from two phases of a 208Y/120-volt system. Is this still "single-phase"? Clarity is improved by removing "single-phase". The voltage level is adequate for identifying the branch circuit requiring GFCI protection. For identifying a 3-wire feeder from a 208Y/120 volt, 3-phase, 4-wire system, CMP-6 in 310.15(E) uses the phrase "... consisting of two phase conductors and the neutral conductor..."
It seems to be a step backwards to locate the exceptions at the end of the section. (I read the Correlating Committee's comment.) At least, clarity needs to be added to revise the exceptions to show which of the list items the exception applies to.
The wording of the exception to 210.8(A)(5) is revised to comply with the Correlating Committee's comment.
Regarding the Exception to 210.8(A), CMP-9 uses the phrase in 310.27(C) "ceiling-suspended (paddle) fan. This exception should be changed as proposed to be consistent.

Related Item

- PI-1963

Submitter Information Verification

Submitter Full Name: Phil Simmons
Organization: Simmons Electrical Services
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jul 07 18:16:59 EDT 2021
Committee: NEC-P02

Public Comment No. 1755-NFPA 70-2021 [Section No. 210.8(A)]

(A) Dwelling Units.

All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (A)(11) and supplied by single-phase branch circuits rated 150 volts or less to ground shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms

(2) Garages and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use

(3) Outdoors

(4) Crawl spaces — at or below grade level

(5) Basements

Informational Note: See 760.41(B) and 760.121(B) for power supply requirements for fire alarm systems.

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(6) Kitchens — where the receptacles are installed to serve the countertop surfaces

(7) Sinks — where receptacles or cord-and-plug-connected fixed or stationary appliances are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink

(8) Boathouses

(9) Bathtubs or shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall

(10) Laundry areas

(11) Indoor damp and wet locations

Exception No. 1: Receptacles that are not readily accessible and are supplied by a branch circuit dedicated to electric snow-melting, deicing, or pipeline and vessel heating equipment shall be permitted to be installed in accordance with 426.28 or 427.22, as applicable.

Exception No. 2: A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

Exception No. 3: Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a general-purpose convenience receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

Statement of Problem and Substantiation for Public Comment

FR 8954-NFPA 70-2021 incorporated the text "or cord-and-plug-connected fixed and stationary appliances" in 210.8(B)(7) and gave the accompanying statement "List item (7) Sinks: Added language to address fixed or stationary appliances and their proximity to sinks as the hazard exists for faulted appliances and the hazard is not necessarily driven by the location of the receptacle. This FR passed ballot with a unanimous vote and the requirements of the PI were incorporated into the text of 210.8(B) as published in the first draft report.

Comparison of the code text that was used in FR 8954-NFPA 70-2021 and the accompanying committee statement reveals that the code text requires the appliance to be both "...fixed and stationary..." to require this type of protection, while the committee statement appears to indicate that the intent is that this type of protection should be required when the appliance is either "...fixed or stationary..." Therefore, the language proposed in this PC uses "or" rather than "and" to clarify the requirement.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 1757-NFPA 70-2021 [Section No. 210.8(B)]	
Public Comment No. 1757-NFPA 70-2021 [Section No. 210.8(B)]	

Related Item

• PI 1963-NFPA 70-2020 • FR 8954-NFPA 70-2021

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: Tue Aug 17 16:24:48 EDT 2021

Committee: NEC-P02

Public Comment No. 1783-NFPA 70-2021 [Section No. 210.8(A)]

(A) Dwelling Units.

All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (A)(11) and supplied by single-phase branch circuits rated 150 volts or less to ground shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms

(2) Garages and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use

<u>Exception to (2): Receptacles greater than 20A installed and labeled exclusively for the use of cord-and-plug-connected EVSE as per 625.17, 625.22, 625.42, 625.44, and 625.56.</u>

(1) Outdoors

(2) Crawl spaces — at or below grade level

(3) Basements

Informational Note: See 760.41(B) and 760.121(B) for power supply requirements for fire alarm systems.

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(4) Kitchens — where the receptacles are installed to serve the countertop surfaces

(5) Sinks — where receptacles are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink

(6) Boathouses

(7) Bathtubs or shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall

(8) Laundry areas

(9) Indoor damp and wet locations

Exception No. 1: Receptacles that are not readily accessible and are supplied by a branch circuit dedicated to electric snow-melting, deicing, or pipeline and vessel heating equipment shall be permitted to be installed in accordance with 426.28 or 427.22, as applicable.

Exception No. 2: A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

Exception No. 3: Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a general-purpose convenience receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

Statement of Problem and Substantiation for Public Comment

The requirement for plug-in EVSE to meet UL 2231-1&2, UL 2594, & UL 2202 as referenced by 625.1, 625.5, and Annex A, renders a GFCI protected receptacle redundant, except for the cord to the EVSE which is length limited by 625.17. 625.22 specifically provides for Personnel Protection System. UL 2231 provides alternatives to CCID5, whereas the definition of GFCI requires Class A, basically CCID5. Our proposals for several other related articles address labeling of receptacles to avoid other devices being plugged in (such as a range, dryer, etc.), along with the fact that the receptacle is being installed in a parking stall. If a GFCI is provided it risks tripping and terminating a charge session until manually reset, presumably at the branch circuit panel, whereas the Personnel Protection circuits of UL 2231 approved equipment are capable of automatic retries to address transient conditions such as surges, which allow charge sessions to resume if the fault was temporary, without compromising safety. 625.56 deals with in-use covers for wet location receptacles. At least receptacles installed for Fastened-in-Place EVSE per 625.44(B) should be exempted from GFCI protection.

Related Item								
• PI-3065, FR-9471	• PI-2238, FR-9474	• PC-1797 proposes to remove the GFCI receptacle requirement for non-dwelling unit garage receptacles.	• PC-1803 proposes an exemption for rating limited EVSE receptacles	• PC-1816 proposes allowing 80 A branch feeding multiple 50 A receptacles subject to listing and labeling	• PC-2014 also proposes multiple outlets on shared branch subject to rating limitation	• PC-2025 proposes allowing 14-60R for portable equipment	• PC-2026 proposes allowing 14-60R for fastened in place equip.	• PC-2129 proposes exempting receptacles above 20A/120VAC from GFCI subject to labeling as EV-only, rating limited, or rendered inaccessible by EVSE installation.

Submitter Information Verification

Submitter Full Name: Kevin Cheong
Organization: ChargePoint Inc.
Affiliation: ChargePoint Inc.

Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Tue Aug 17 18:39:48 EDT 2021
Committee:	NEC-P02

Public Comment No. 2201-NFPA 70-2021 [Section No. 210.8(A)]

(A) Dwelling Units.

All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (A)(11) and supplied by single-phase branch circuits rated 150 volts or less to ground shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms

(2) Garages and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use

(3) Outdoors

(4) Crawl spaces — at or below grade level

(5) Basements

Informational Note: See 760.41(B) and 760.121(B) for power supply requirements for fire alarm systems.

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(6) Kitchens — where the receptacles are installed to serve the countertop surfaces

(7) Sinks — where receptacles are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink

(8) Boathouses

(9) Bathtubs or shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall

(10) Laundry areas

(11) Indoor damp and wet locations

Exception No. 1: Receptacles that are not readily accessible and are supplied by a branch circuit dedicated to electric snow-melting, deicing, or pipeline and vessel heating equipment shall be permitted to be installed in accordance with 426.28 or 427.22, as applicable.

Exception No. 2: A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

Exception No. 3: Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a general-purpose convenience receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

AHAM is submitting public comments on NEC 2023.

On behalf of the Association of Home Appliance Manufacturers (AHAM), I would like to provide our comments on 2023 NEC. AHAM continues to be concerned about NFPA's specifying product level requirements that are beyond the listing requirements yet is not doing anything to assure that the misalignment is addressed.

AHAM represents manufacturers of major, portable and floor care home appliances, and suppliers to the industry. AHAM's membership includes over 150 companies throughout the world. AHAM members employ tens of thousands of people and produce more than 95% of the household appliances shipped for sale. The appliance industry directly employs over 377,000 workers in the U.S. and AHAM members produce more than 95% of the household appliances shipped for sale domestically. The industry's total economic impact exceeds $198 billion. The home appliance industry, through its products and innovation, is essential to consumer lifestyle, health, safety and convenience. Through its technology, employees and productivity, the industry contributes significantly to jobs and economic security. Home appliances also are a success story in terms of energy efficiency and environmental impact as new appliances often represent the most effective choice a consumer can make to reduce home energy use and costs.

AHAM supports NFPA and the efforts to have a US National Electric Code. AHAM is a member of CMP-17 and has applied for membership of CMP-2. AHAM is concerned that NFPA continues to establish requirements for AFCIs and GFCIs when there are known nuisance tripping issues between the devices and other products.

- *The addition of the GFCI requirement on 240 volt circuits has created a product requirement for HVAC equipment as noted in TIA 1564 that is beyond the listing requirements for the HVAC equipment. This is similar to the issues AHAM brought up in TIA's 1537 and 1563. A transition period was not provided, thus multiple states have resorted to amending the 2020 NEC, removing or delaying the recent changes The TIA requests from both AHAM and AHRI was to provide short term relief from incompatibility tripping of mandated GFCI receptacles, while robust technological solutions are developed and deployed by manufacturers. This extension of the effectivity date on GFCI clauses has been a common theme of TIA requests in the last 12 months. NFPA needs to look at their effectivity date setting process. NFPA is not talking, not listening, nor proactively working with parallel SDOs before implementing their own product requirement that is beyond the product listing requirement. AHAM recommends NFPA review processes at other standards development organizations, specifically how effectivity dates are set and the subsequent communications to announce them.*
    - *AHAM has put out the following press release on the GFCI and electric range compatibility issue. https://www.aham.org/AHAM/News/Latest_News/AHAM_Releases_Recommendations_for_Range_Placement.aspx*

Statement of Problem and Substantiation for Public Comment

GFCI/Appliance incompatibility issues

Related Item

- Public Input No. 2588-

Submitter Information Verification

Submitter Full Name:	Matt Williams
Organization:	Association of Home Appliance
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Thu Aug 19 16:29:40 EDT 2021
Committee:	NEC-P02

Public Comment No. 540-NFPA 70-2021 [Section No. 210.8(A)]

(A) Dwelling Units.

All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (A)(11) and supplied by single-phase branch circuits rated 150 volts or less to ground shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms

(2) Garages and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use

(3) Outdoors

(4) Crawl spaces — at or below grade level

(5) Basements

Informational Note: See 760.41(B) and 760.121(B) for power supply requirements for fire alarm systems.

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(6) Kitchens — where the receptacles are installed to serve the countertop surfaces

(7) Sinks — where receptacles are installed within 1.8 m (6 ft) from any of the top inside ~~edge~~ edges of the bowl of the sink

(8) Boathouses

(9) Bathtubs or shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall

(10) Laundry areas

(11) Indoor damp and wet locations

Exception No. 1: Receptacles that are not readily accessible and are supplied by a branch circuit dedicated to electric snow-melting, deicing, or pipeline and vessel heating equipment shall be permitted to be installed in accordance with 426.28 or 427.22, as applicable.

Exception No. 2: A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

Exception No. 3: Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a general-purpose convenience receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

Statement of Problem and Substantiation for Public Comment

The bowl of the sink could be thought to have multiple top inside edges. The proposed language aims to make the installation safer by resolving any confusion in enforcement.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 542-NFPA 70-2021 [Section No. 210.8(B)]	

Related Item

• 210.8 (A)(7)

Submitter Information Verification

Submitter Full Name: Piyush Jaybhaye

Organization: Arcadis U.S. Inc.

Street Address:

City:

State:

Zip:

Submittal Date: Thu Jul 29 17:07:59 EDT 2021

Committee: NEC-P02

Public Comment No. 850-NFPA 70-2021 [Section No. 210.8(A)]

(A) Dwelling Units.

All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (A)(11) and supplied by single-phase branch circuits rated 150 volts or less to ground shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms

(2) Garages and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use

(3) Outdoors

(4) Crawl spaces — at or below grade level

(5) Basements

Informational Note: See 760.41(B) and 760.121(B) for power supply requirements for fire alarm systems.

Receptacles installed under the exception to 210.8(A)(5) shall not be considered as meeting the requirements of 210.52(G).

(6) Kitchens — where the receptacles are installed to serve the countertop surfaces

(7) Sinks — where receptacles are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink

(8) Boathouses

(9) Bathtubs or shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall

(10) Laundry areas

(11) Indoor damp and wet locations

Exception No. 1: Receptacles that are not readily accessible and are supplied by a branch circuit dedicated to electric snow-melting, deicing, or pipeline and vessel heating equipment shall be permitted to be installed in accordance with 426.28 or 427.22, as applicable.

Exception No. 2: A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

Exception No. 3: Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a general-purpose convenience receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

Additional Proposed Changes

File Name	Description	Approved
CN_113.pdf	70_CN113	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 113 appeared in the First Draft Report.

The Correlating Committee notes that Exception No. 1 is a permissive exception and shall be located after the mandatory exceptions in accordance with NEC Style Manual 2.6.1. In addition, it is noted that Exception No. 2 does not correlate with the language in 760.41 (B) and 760.121. These sections don't permit GFCI protection for these circuits.

Related Item

• Correlating Note No. 113

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 04 14:35:44 EDT 2021
Committee: NEC-P02

Correlating Committee Note No. 113-NFPA 70-2021 [Section No. 210.8(A)]

Submitter Information Verification

Committee: NEC-AAC

Submittal Date: Tue May 04 13:58:42 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee notes that Exception No. 1 is a permissive exception and shall be located after the mandatory exceptions in accordance with NEC Style Manual 2.6.1. In addition, it is noted that Exception No. 2 does not correlate with the language in 760.41(B) and 760.121. These sections don't permit GFCI protection for these circuits.

Ballot Results

✔ **This item has passed ballot**

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

Affirmative All

Ayer, Lawrence S.

Gallo, Ernest J.

Hickman, Palmer L.

Holub, Richard A.

Hunter, Dean C.

Johnston, Michael J.

Kendall, David H.

Kovacik, John R.

Manche, Alan

McDaniel, Roger D.

Porter, Christine T.

Williams, David A.

Public Comment No. 1299-NFPA 70-2021 [Section No. 210.8(B)]

(B) Other Than Dwelling Units.

All 125-volt through 250-volt receptacles supplied by single-phase branch circuits rated 150 volts or less to ground, 50 amperes or less, and all receptacles supplied by three-phase branch circuits rated 150 volts or less to ground, 100 amperes or less, installed in the following locations shall be provided with GFCI protection:

(1) Bathrooms

(2) ~~Kitchens~~

(3) Areas with sinks and permanent provisions for food preparation, beverage preparation, or cooking

(4) Buffet serving areas with permanent provisions for food serving, beverage serving, or cooking

(5) Rooftops

Exception to (5): Receptacles on rooftops shall not be required to be readily accessible other than from the rooftop.

(6) Outdoors

(7) Sinks where receptacles or cord-and-plug-connected fixed and stationary appliances are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink

Exception No. 1 to (7): In industrial establishments only, where the conditions of maintenance and supervision ensure that only qualified personnel are involved, an assured equipment grounding conductor program in accordance with 590.6(B)(2) shall be permitted for only those receptacle outlets used to supply equipment that would create a greater hazard if power is interrupted or that has a design not compatible with GFCI protection.

Exception No. 2 to (7): In industrial laboratories, receptacles used to supply equipment where removal of power would introduce a greater hazard shall be permitted to be installed without GFCI protection.

Exception No. 3 to (7): Receptacles located in patient bed locations of Category 2 (general care) or Category 1 (critical care) spaces of health care facilities shall be permitted to comply with 517.21.

(8) Indoor damp or wet locations

(9) Locker rooms with associated showering facilities

(10) Garages, accessory buildings, service bays, and similar areas other than vehicle exhibition halls and showrooms

(11) Crawl spaces at or below grade level

(12) Unfinished areas of basements

Exception to (1) through (7), (10), and (12): Listed locking support and mounting receptacles used in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be GFCI protected. If a general-purpose convenience receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(13) Aquariums, bait wells, and similar open aquatic vessels or containers, such as tanks or bowls, where receptacles are installed within 1.8 m (6 ft.) from the top inside edge or rim or from the conductive support framing of the vessel or container

(14) Laundry areas

(15) Bathtubs and shower stalls where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall

Exception to (1) through (15): Receptacles that are not readily accessible and are supplied by a branch circuit dedicated to electric snow-melting, deicing, or pipeline and vessel heating equipment shall be permitted to be installed in accordance with 426.28 or 427.22, as applicable.

Statement of Problem and Substantiation for Public Comment

The present language of (first draft) 210.8(B)(3) already includes anything that meets the definition of a kitchen.

Related Item

• FR8954

Submitter Information Verification

Submitter Full Name:	Ryan Jackson
Organization:	Ryan Jackson
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Aug 11 16:25:35 EDT 2021
Committee:	NEC-P02

Public Comment No. 1634-NFPA 70-2021 [Section No. 210.8(B)]

(B) Other Than Dwelling Units.

All 125-volt through 250-volt receptacles supplied by single-phase branch circuits rated 150 volts or less to ground, 50 amperes or less, and all receptacles supplied by three-phase branch circuits rated 150 volts or less to ground, 100 amperes or less, installed in the following locations shall be provided with GFCI protection:

(1) Bathrooms

(2) Kitchens

(3) Areas with sinks and permanent provisions for food preparation, beverage preparation, or cooking

(4) Buffet serving areas with permanent provisions for food serving, beverage serving, or cooking

(5) Rooftops

Exception to (5): Receptacles on rooftops shall not be required to be readily accessible other than from the rooftop.

(6) Outdoors

(7) Sinks where receptacles or cord-and-plug-connected fixed and stationary appliances are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink

Exception No. 1 to (7): In industrial establishments only, where the conditions of maintenance and supervision ensure that only qualified personnel are involved, an assured equipment grounding conductor program in accordance with 590.6(B)(2) shall be permitted for only those receptacle outlets used to supply equipment that would create a greater hazard if power is interrupted or that has a design not compatible with GFCI protection.

Exception No. 2 to (7): In industrial laboratories, receptacles used to supply equipment where removal of power would introduce a greater hazard shall be permitted to be installed without GFCI protection.

Exception No. 3 to (7): Receptacles located in patient bed locations of Category 2 (general care) or Category 1 (critical care) spaces of health care facilities shall be permitted to comply with 517.21.

(8) Indoor damp or wet locations

(9) Locker rooms with associated showering facilities

(10) Garages, accessory buildings, service bays, and similar areas other than vehicle exhibition halls and showrooms

(11) Crawl spaces at or below grade level

(12) Unfinished areas of basements

Exception to (1) through (7), (10), and (12): Listed locking support and mounting receptacles used in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be GFCI protected. If a general-purpose convenience receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(13) Aquariums, bait wells, and similar open aquatic vessels or containers, such as tanks or bowls, where receptacles are installed within 1.8 m (6 ft.) from the top inside edge or rim or from the conductive support framing of the vessel or container

(14) Laundry areas

(15) Bathtubs and shower stalls where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall

Exception to (1) through (15): Receptacles that are not readily accessible and are supplied by a branch circuit dedicated to electric snow-melting, deicing, or pipeline and vessel heating equipment shall be permitted to be installed in accordance with 426.28 or 427.22, as applicable.

Statement of Problem and Substantiation for Public Comment

The exception to (B)(5) should be located in 210.8, not 210.8(B). The requirement for ready access is not in (B)(5), it is in 210.8. Please accept PI 844 as submitted.

Related Item

• PI 944

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Ryan Jackson
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 16 18:31:59 EDT 2021

Committee:	NEC-P02

Public Comment No. 1757-NFPA 70-2021 [Section No. 210.8(B)]

(B) Other Than Dwelling Units.

All 125-volt through 250-volt receptacles supplied by single-phase branch circuits rated 150 volts or less to ground, 50 amperes or less, and all receptacles supplied by three-phase branch circuits rated 150 volts or less to ground, 100 amperes or less, installed in the following locations shall be provided with GFCI protection:

(1) Bathrooms

(2) Kitchens

(3) Areas with sinks and permanent provisions for food preparation, beverage preparation, or cooking

(4) Buffet serving areas with permanent provisions for food serving, beverage serving, or cooking

(5) Rooftops

Exception to (5): Receptacles on rooftops shall not be required to be readily accessible other than from the rooftop.

(6) Outdoors

(7) Sinks where receptacles or cord-and-plug-connected fixed ~~and~~ or stationary appliances are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink

Exception No. 1 to (7): In industrial establishments only, where the conditions of maintenance and supervision ensure that only qualified personnel are involved, an assured equipment grounding conductor program in accordance with 590.6(B)(2) shall be permitted for only those receptacle outlets used to supply equipment that would create a greater hazard if power is interrupted or that has a design not compatible with GFCI protection.

Exception No. 2 to (7): In industrial laboratories, receptacles used to supply equipment where removal of power would introduce a greater hazard shall be permitted to be installed without GFCI protection.

Exception No. 3 to (7): Receptacles located in patient bed locations of Category 2 (general care) or Category 1 (critical care) spaces of health care facilities shall be permitted to comply with 517.21.

(8) Indoor damp or wet locations

(9) Locker rooms with associated showering facilities

(10) Garages, accessory buildings, service bays, and similar areas other than vehicle exhibition halls and showrooms

(11) Crawl spaces at or below grade level

(12) Unfinished areas of basements

Exception to (1) through (7), (10), and (12): Listed locking support and mounting receptacles used in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be GFCI protected. If a general-purpose convenience receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(13) Aquariums, bait wells, and similar open aquatic vessels or containers, such as tanks or bowls, where receptacles are installed within 1.8 m (6 ft.) from the top inside edge or rim or from the conductive support framing of the vessel or container

(14) Laundry areas

(15) Bathtubs and shower stalls where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall

Exception to (1) through (15): Receptacles that are not readily accessible and are supplied by a branch circuit dedicated to electric snow-melting, deicing, or pipeline and vessel heating equipment shall be permitted to be installed in accordance with 426.28 or 427.22, as applicable.

Statement of Problem and Substantiation for Public Comment

A comparison of the code text that was used in FR 8954-NFPA 70-2021 and the accompanying committee statement reveals that the code text requires the appliance to be both "...fixed and stationary..." to require this type of protection, while the committee statement appears to indicate that the intent is that this type of protection should be required when the appliance is either "...fixed or stationary..." Therefore, the language proposed in this PC uses "or" rather than "and" to clarify the requirement.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 1755-NFPA 70-2021 [Section No. 210.8(A)]	
Public Comment No. 1755-NFPA 70-2021 [Section No. 210.8(A)]	

Related Item

• FR 8954-NFPA 70-2021

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:	Tue Aug 17 16:36:14 EDT 2021
Committee:	NEC-P02

Public Comment No. 1797-NFPA 70-2021 [Section No. 210.8(B)]

(B) Other Than Dwelling Units.

All 125-volt through 250-volt receptacles supplied by single-phase branch circuits rated 150 volts or less to ground, 50 amperes or less, and all receptacles supplied by three-phase branch circuits rated 150 volts or less to ground, 100 amperes or less, installed in the following locations shall be provided with GFCI protection:

(1) Bathrooms

(2) Kitchens

(3) Areas with sinks and permanent provisions for food preparation, beverage preparation, or cooking

(4) Buffet serving areas with permanent provisions for food serving, beverage serving, or cooking

(5) Rooftops

Exception to (5): Receptacles on rooftops shall not be required to be readily accessible other than from the rooftop.

(6) Outdoors

(7) Sinks where receptacles or cord-and-plug-connected fixed and stationary appliances are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink

Exception No. 1 to (7): In industrial establishments only, where the conditions of maintenance and supervision ensure that only qualified personnel are involved, an assured equipment grounding conductor program in accordance with 590.6(B)(2) shall be permitted for only those receptacle outlets used to supply equipment that would create a greater hazard if power is interrupted or that has a design not compatible with GFCI protection.

Exception No. 2 to (7): In industrial laboratories, receptacles used to supply equipment where removal of power would introduce a greater hazard shall be permitted to be installed without GFCI protection.

Exception No. 3 to (7): Receptacles located in patient bed locations of Category 2 (general care) or Category 1 (critical care) spaces of health care facilities shall be permitted to comply with 517.21.

(8) Indoor damp or wet locations

(9) Locker rooms with associated showering facilities

(10) Garages, accessory buildings, service bays, and similar areas other than vehicle exhibition halls and showrooms

<u>*Exception to (10):* Receptacles greater than 20A installed and labeled exclusively for the use of cord-and-plug-connected EVSE as per 625.17, 625.22, 625.42, 625.44, and 625.56.</u>

(1) Crawl spaces at or below grade level

(2) Unfinished areas of basements

Exception to (1) through (7), (10), and (12): Listed locking support and mounting receptacles used in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be GFCI protected. If a general-purpose convenience receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(3) Aquariums, bait wells, and similar open aquatic vessels or containers, such as tanks or bowls, where receptacles are installed within 1.8 m (6 ft.) from the top inside edge or rim or from the conductive support framing of the vessel or container

(4) Laundry areas

(5) Bathtubs and shower stalls where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall

Exception to (1) through (15): Receptacles that are not readily accessible and are supplied by a branch circuit dedicated to electric snow-melting, deicing, or pipeline and vessel heating equipment shall be permitted to be installed in accordance with 426.28 or 427.22, as applicable.

Statement of Problem and Substantiation for Public Comment

In order to facilitate EV-Ready programs (providing infrastructure for buildings to support mass adoption of EVs), while ensuring safety, we suggest GFCI protection is redundant to the required Personnel Protection systems mandated by UL 2231, articles 625.1, 625.5, 625.22, Annex A, and other existing measures that reduce the risk of electric shock such as 625.17, 56, etc. Requiring an electrician to install a hardwired EVSE for an EV-Ready site, or requiring GFCI protection of a receptacle installed specifically for a load managed receptacle at an EV-Ready site, adds cost we feel unnecessary. Also Class A GFCI protection risks nuisance tripping indefinitely terminating charging (until manually reset) whereas UL 2231 Personnel Protection systems allow for automatic resumption after transient events. See comment on 210.8A also.

Related Item

- PI-4479 noted that the GFCI provisions are redundant to 210.8
- FR-9471 acknowledged the redundancy of 625.54
- PC-1783 proposes to waive GFCI for dwelling unit garage receptacles for EV charging.

Submitter Information Verification

Submitter Full Name: Kevin Cheong
Organization: ChargePoint Inc.
Affiliation: ChargePoint Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 17 19:43:57 EDT 2021
Committee: NEC-P02

Public Comment No. 260-NFPA 70-2021 [Section No. 210.8(B)]

(B) Other Than Dwelling Units.

All 125-volt through 250-volt receptacles supplied by ~~single-phase~~ branch circuits rated 150 volts or less to ground, ~~50 amperes or less, and all receptacles supplied by three-phase branch circuits rated 150 volts or less to ground,~~ 100 amperes or less, installed in the following locations shall be provided with GFCI protection:

(1) Bathrooms

(2) Kitchens

(3) Areas with sinks and permanent provisions for food preparation, beverage preparation, or cooking

(4) Buffet serving areas with permanent provisions for food serving, beverage serving, or cooking

(5) Rooftops

Exception to (5): Receptacles on rooftops shall not be required to be readily accessible other than from the rooftop.

(6) Outdoors

(7) Sinks where receptacles or cord-and-plug-connected fixed and stationary appliances are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink

Exception No. 1 to (7): In industrial establishments only, where the conditions of maintenance and supervision ensure that only qualified personnel are involved, an assured equipment grounding conductor program in accordance with 590.6(B)(2) shall be permitted for only those receptacle outlets used to supply equipment that would create a greater hazard if power is interrupted or that has a design not compatible with GFCI protection.

Exception No. 2 to (7): In industrial laboratories, receptacles used to supply equipment where removal of power would introduce a greater hazard shall be permitted to be installed without GFCI protection.

Exception No. 3 to (7): Receptacles located in patient bed locations of Category 2 (general care) or Category 1 (critical care) spaces of health care facilities shall be permitted to comply with 517.21.

(8) Indoor damp or wet locations

(9) Locker rooms with associated showering facilities

(10) Garages, accessory buildings, service bays, and similar areas other than vehicle exhibition halls and showrooms

(11) Crawl spaces at or below grade level

(12) Unfinished areas of basements

Exception to (1) through (7), (10), and (12): Listed locking support and mounting receptacles used in combination with compatible attachment fittings installed for the purpose of ~~serving a~~ supporting a ceiling luminaire or ceiling-suspended paddle fan shall not be required to be GFCI protected. If a general-purpose convenience receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(13) Aquariums, bait wells, and similar open aquatic vessels or containers, such as tanks or bowls, where receptacles are installed within 1.8 m (6 ft.) from the top inside edge or rim or from the conductive support framing of the vessel or container

(14) Laundry areas

(15) Bathtubs and shower stalls where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall

Exception to (1) through (15): Receptacles that are not readily accessible and are supplied by a branch circuit dedicated to electric snow-melting, deicing, or pipeline and vessel heating equipment shall be permitted to be installed in accordance with 426.28 or 427.22, as applicable.

Statement of Problem and Substantiation for Public Comment

"Single-phase" needs to be removed for clarity. Some branch circuits can be supplied from two phases of a 208Y/120-volt system. Is this still "single-phase"? Clarity is improved by removing "single-phase". The voltage to ground is adequate for identifying the branch circuit requiring GFCI protection. For identifying a 3-wire feeder from a 208Y/120 volt, 3-phase, 4-wire system, CMP-6 in 310.15(E) uses the phrase "... consisting of two phase conductors and the neutral conductor..."
There is no need to have the two amperage levels in the stem for this rule. 50 amperes is less that 100 amperes so those receptacles are included in the phrase 100 amperes or less.
Regarding the Exception to 210.8(B), CMP-9 uses the phrase in 310.27(C) "ceiling-suspended (paddle) fan. This exception should be changed as proposed to be consistent.

Related Item

• FR-8954

Submitter Information Verification

Submitter Full Name: Phil Simmons
Organization: Simmons Electrical Services

Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Sun Jul 18 14:11:13 EDT 2021
Committee:	NEC-P02

Public Comment No. 542-NFPA 70-2021 [Section No. 210.8(B)]

(B) Other Than Dwelling Units.

All 125-volt through 250-volt receptacles supplied by single-phase branch circuits rated 150 volts or less to ground, 50 amperes or less, and all receptacles supplied by three-phase branch circuits rated 150 volts or less to ground, 100 amperes or less, installed in the following locations shall be provided with GFCI protection:

(1) Bathrooms

(2) Kitchens

(3) Areas with sinks and permanent provisions for food preparation, beverage preparation, or cooking

(4) Buffet serving areas with permanent provisions for food serving, beverage serving, or cooking

(5) Rooftops

Exception to (5): Receptacles on rooftops shall not be required to be readily accessible other than from the rooftop.

(6) Outdoors

(7) Sinks where receptacles or cord-and-plug-connected fixed and stationary appliances are installed within 1.8 m (6 ft) from any of the top inside ~~edge~~ edges of the bowl of the sink

Exception No. 1 to (7): In industrial establishments only, where the conditions of maintenance and supervision ensure that only qualified personnel are involved, an assured equipment grounding conductor program in accordance with 590.6(B)(2) shall be permitted for only those receptacle outlets used to supply equipment that would create a greater hazard if power is interrupted or that has a design not compatible with GFCI protection.

Exception No. 2 to (7): In industrial laboratories, receptacles used to supply equipment where removal of power would introduce a greater hazard shall be permitted to be installed without GFCI protection.

Exception No. 3 to (7): Receptacles located in patient bed locations of Category 2 (general care) or Category 1 (critical care) spaces of health care facilities shall be permitted to comply with 517.21.

(8) Indoor damp or wet locations

(9) Locker rooms with associated showering facilities

(10) Garages, accessory buildings, service bays, and similar areas other than vehicle exhibition halls and showrooms

(11) Crawl spaces at or below grade level

(12) Unfinished areas of basements

Exception to (1) through (7), (10), and (12): Listed locking support and mounting receptacles used in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be GFCI protected. If a general-purpose convenience receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(13) Aquariums, bait wells, and similar open aquatic vessels or containers, such as tanks or bowls, where receptacles are installed within 1.8 m (6 ft.) from the top inside edge or rim or from the conductive support framing of the vessel or container

(14) Laundry areas

(15) Bathtubs and shower stalls where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall

Exception to (1) through (15): Receptacles that are not readily accessible and are supplied by a branch circuit dedicated to electric snow-melting, deicing, or pipeline and vessel heating equipment shall be permitted to be installed in accordance with 426.28 or 427.22, as applicable.

Statement of Problem and Substantiation for Public Comment

The bowl of the sink could be thought to have multiple top inside edges. The proposed language aims to make the installation safer by resolving any confusion in enforcement.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 540-NFPA 70-2021 [Section No. 210.8(A)]	

Related Item

• 210.8 (B)(7)

Submitter Information Verification

Submitter Full Name: Piyush Jaybhaye
Organization: Arcadis U.S. Inc.
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City:
State:
Zip:
Submittal Date: Thu Jul 29 17:58:32 EDT 2021
Committee: NEC-P02

Public Comment No. 751-NFPA 70-2021 [Section No. 210.8(B)]

(B) Other Than Dwelling Units.

All 125-volt through 250-volt receptacles supplied by single-phase branch circuits rated 150 volts or less to ground, 50 amperes or less, and all receptacles supplied by three-phase branch circuits rated 150 volts or less to ground, 100 amperes or less, installed in the following locations shall be provided with GFCI protection:

(1) Bathrooms

(2) Kitchens

(3) Areas with sinks and permanent provisions for food preparation, beverage preparation, or cooking

(4) Buffet serving areas with permanent provisions for food serving, beverage serving, or cooking

(5) Rooftops

Exception to (5): Receptacles on rooftops shall not be required to be readily accessible other than from the rooftop.

(6) Outdoors

(7) Sinks where receptacles or cord-and-plug-connected fixed and stationary appliances are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink

Exception No. 1 to (7): In industrial establishments only, where the conditions of maintenance and supervision ensure that only qualified personnel are involved, an assured equipment grounding conductor program in accordance with 590.6(B)(2) shall be permitted for only those receptacle outlets used to supply equipment that would create a greater hazard if power is interrupted or that has a design not compatible with GFCI protection.

Exception No. 2 to (7): In industrial laboratories, receptacles used to supply equipment where removal of power would introduce a greater hazard shall be permitted to be installed without GFCI protection.

Exception No. 3 to (7): Receptacles located in patient bed locations of Category 2 (general care) or Category 1 (critical care) spaces of health care facilities shall be permitted to comply with 517.21.

(8) Indoor damp or wet locations <u>*Exception to (6): Identified receptacles in qualified electrical test laboratories if the conditions and supervision ensure that only qualified personnel are performing tests.*</u>

(9) Locker rooms with associated showering facilities

(10) Garages, accessory buildings, service bays, and similar areas other than vehicle exhibition halls and showrooms

(11) Crawl spaces at or below grade level

(12) Unfinished areas of basements

Exception to (1) through (7), (10), and (12): Listed locking support and mounting receptacles used in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be GFCI protected. If a general-purpose convenience receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

(13) Aquariums, bait wells, and similar open aquatic vessels or containers, such as tanks or bowls, where receptacles are installed within 1.8 m (6 ft.) from the top inside edge or rim or from the conductive support framing of the vessel or container

(14) Laundry areas

(15) Bathtubs and shower stalls where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall

Exception to (1) through (15): Receptacles that are not readily accessible and are supplied by a branch circuit dedicated to electric snow-melting, deicing, or pipeline and vessel heating equipment shall be permitted to be installed in accordance with 426.28 or 427.22, as applicable.

Statement of Problem and Substantiation for Public Comment

The proposed exception to 210.8(B) in the P.I. was reasonable, but the substantiation did not indicate why all receptacles should be excepted. Some may be key to the research, subject to leakage, and treated with adequate safeguards. Others probably are appropriate to treat more normally, protected from moisture with bubble covers or snap-closed covers, with the normal GFCI protection.
The CMP does not disagree that exempting certain receptacles would be appropriate in qualified electrical test laboratories. I don't know what "qualified" adds, but I have no strong objection to its use. If the adjectives “qualified” and “electrical” are the key, “qualified” is already part of the P.I.; this P.C. adds" electrical" to conform to the CMP's langauge.

<u>Related Item</u>

• PI 1425

Submitter Information Verification

Submitter Full Name: David Shapiro
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City:	
State:	
Zip:	
Submittal Date:	Tue Aug 03 18:28:48 EDT 2021
Committee:	NEC-P02

Public Comment No. 1839-NFPA 70-2021 [Section No. 210.8(D)]

(D) Specific Appliances.

GFCI protection shall be provided for the branch ~~circuit or outlet~~ circuit supplying the following appliances rated 150 volts or less to ground and 60 amperes or less, single- or 3-phase:

(1) Automotive vacuum machines

(2) Drinking water coolers and bottle fill stations

(3) Cord-and-plug-connected high-pressure spray washing machines

(4) Tire inflation machines

(5) Vending machines

(6) Sump pumps

(7) Dishwashers

Statement of Problem and Substantiation for Public Comment

The panel statement to FR 8865 is incorrect. The committee statement states, “the proposed language will ensure GFCI protection is located in the branch circuit.” The revised 2023 code text allows GFCI at the outlet. The panel statement should be corrected to reflect the change. The words “or outlet are struck through only as a work around to be able to make the comment about the incorrect panel statement or to identify a correction is needed.

Related Item

• FR 8865

Submitter Information Verification

Submitter Full Name: Agnieszka Golriz
Organization: NECA
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City:
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Zip:

Submittal Date: Wed Aug 18 10:29:45 EDT 2021
Committee: NEC-P02

Public Comment No. 261-NFPA 70-2021 [Section No. 210.8(D)]

~~**(D)** Specific Appliances.~~

~~GFCI protection shall be provided for the branch circuit or outlet supplying the following appliances rated 150 volts or less to ground and 60 amperes or less, single- or 3-phase:~~

(1) ~~Automotive vacuum machines~~

(2) ~~Drinking water coolers and bottle fill stations~~

(3) ~~Cord-and-plug-connected high-pressure spray washing machines~~

(4) ~~Tire inflation machines~~

(5) ~~Vending machines~~

(6) ~~Sump pumps~~

(7) ~~Dishwashers~~

Statement of Problem and Substantiation for Public Comment

This section needs to be deleted. The personnel protection contemplated by this section for the equipment noted is covered in 422.5(A).
In addition, CMP-17 has modified the list of equipment that requires GFCI protection.
It is difficult to keep requirements in the NEC identical when the rules exist in two different locations. Since we are talking appliances here, the requirements really belong in Article 422.
Renumber the sections following 210.8(C).

Related Item

• FR-8865, FR8316

Submitter Information Verification

Submitter Full Name: Phil Simmons
Organization: Simmons Electrical Services
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City:
State:
Zip:

Submittal Date: Sun Jul 18 14:27:58 EDT 2021
Committee: NEC-P02

Public Comment No. 920-NFPA 70-2021 [Section No. 210.8(D)]

(D) Specific Appliances.

~~GFCI protection shall be provided for the branch circuit or outlet~~ Outlets supplying the following appliances rated 150 volts or less to ground and 60 amperes or less, single- or 3-phase shall have GFCI protection :

(1) Automotive vacuum machines

(2) Drinking water coolers and bottle fill stations

(3) Cord-and-plug-connected high-pressure spray washing machines

(4) Tire inflation machines

(5) Vending machines

(6) Sump pumps

(7) Dishwashers

Statement of Problem and Substantiation for Public Comment

Over the years, a number of revisions have been made throughout the NEC to clarify that the GFCI protection is needed in a number of instances regardless of whether a receptacle is used or if something is "hard wired." However, the text as written in the first draft says GFCI protection is required FOR the outlet. In the case of some large industrial panelboards (one example is at least some of the Square D I-Line series), a 2 pole GFCI breaker isn't available. So one means might be to have an enclosed GFCI breaker near the protected and hardwired appliance. In this case, the enclosed GFCI breaker would be considered an "outlet" per article 100 definition. But if the appliance is hardwired into this breaker, then then one might say that this would be a violation since there is no GFCI protection FOR the outlet. Instead in this case the protection will be AT the outlet.

In 210.8C, GFCI protection is required FOR the outlet. This is due to concerns about people being shocked after breaking fixtures while crawling around. An understanding of the reasoning for this rule would cause one to understand that the GFCI protection does need to be provided AHEAD of the outlet. Thus, the language in 210.8 would make sense. For appliances, unless the concern is over people being shocked by the appliance. Thus, there seems to be no reason to prohibit a GFCI AT the outlet. That is, unless the intent of the rule is to require that the outlet be protected by a GFCI upstream of it.

The 2020 text in 210.8D said "outlets shall have." The public input that caused the current proposed change mentioned other concerns other than any history of issues with GFCI protection being at the outlet. Rather, it mentioned concerns about what happens when one assumes that GFCI protection will be provided with the attachment plug. "Shall have" allows the GFCI protection to be at or ahead of the outlet, while also making it clear that it can't be in the attachment plug, and that it is required regardless of whether there is a receptacle.

Related Item

• First Revision No. 8865-NFPA 70-2021 [Section No. 210.8(D)] • Public Input No. 2871-NFPA 70-2020 [Section No. 210.8(D)]

Submitter Information Verification

Submitter Full Name: Josh Weaver

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City:

State:

Zip:

Submittal Date: Wed Aug 04 20:48:39 EDT 2021

Committee: NEC-P02

Public Comment No. 1208-NFPA 70-2021 [Section No. 210.8(F)]

(F) Outdoor Outlets.

For dwellings, all outdoor outlets rated 125 volts through 250 volts, including outlets installed in the following locations, and supplied by single-phase branch circuits rated 150 volts or less to ground, 50 amperes or less, shall be provided with GFCI protection:

(1) Garages that have floors located at or below grade level

(2) Accessory buildings

(3) All outdoor outlets for dwellings other than those covered in 210.8(A), Exception No. 1

(4) Boathouses

(5) Circuits for conductors in metal poles used as verΘ?cal raceways in the following locaΘ?ons:

(a) pool and spa areas

(b) parking lots for arenas, stadiums, theme parks, playgrounds, restaurants, movie theaters,

shopping centers, supermarkets, strip stores, malls, office complexes, medical and dental

offices, warehouses and distribution centers, government buildings, schools, colleges, and

hospitals

(c) playgrounds

(d) parks, water parks and parking lots for parks, water parks, and public pools

Where equipment supplied by an outlet covered under the requirements of this section is replaced, the outlet shall be supplied with GFCI protection.

Exception: GFCI protection shall not be required on lighting outlets other than those covered in 210.8(C).

Statement of Problem and Substantiation for Public Comment

Quoting Inspector Sasso, with whom I agree,
Insulation can become compromised due to winds that gently rock the pole, causing the wires to bang against the interior wall. This event can happen with even moderate winds; high winds are not necessary to cause this condition. The sound can even become audible on a very windy day. This can result in either a temporary or intermittent hazard, where the metal light pole becomes energized for a short period of time due to the damaged insulation. We can protect the pole using GFP which would shut down the circuit, thereby alerting maintenance staff to a potentially dangerous condition. This would also provide a level of protection for people at some level, even though GFP is equipment protection only.
Another issue unique to metal light poles is the amount of unqualified people who service the and maintain the poles. This is just a fact. The net result is that compromised metal poles are exposed not just to these unqualified maintenance people, but to ordinary citizens who may lean on and touch the pole with their hands. This can be a jogger who leans on the pole to get a moment of rest, or a child in a playground, or someone's wife that went shopping. The location of metal light poles (easily reached or touched by the public) makes it an inherently more dangerous structure, in and of itself. We need better codes to address dangers associated with metal light poles.
A final issue unique to metal light poles is that some people remove the cover in order to steal or to “tap” the electrical power. Many times the covers do not get put back on properly. Sometimes, they don't get put back at all. The panel may wish to also consider requiring that the handhole covers be lockable, such that ordinary tools such as screwdrivers cannot be used to remove the handhole covers.
I thought the most appropriate place for this change was in 410, where the Article speaks to metal poles. This would be the correct section, IMO.
Accidents involving metal light poles are not uncommon:
https://www.fox4news.com/news/teen-recovering-after-being-shocked-at-cleburne-park
https://www.21cpw.com/usps-worker-electrocuted-at-shannon-street-post-office/
National Fire Protection Association Report https://submittals.nfpa.org/TerraViewWeb/ContentFetcher?commentPar...
113 of 196 3/2/2021, 1:25 PM
Here is another incident below. Although this is a city light pole and not a pole that would fall under the scope of my proposed language, I want to draw attention to the “human nature” aspect of this accident – the fact that people love to touch metal light poles. Like a moth to the flame, people are drawn to touch, lean on, and rest on metal poles. This is human nature. This is simply what people do:
"I had my ankle weights on," he said. "I leaned up against the pole. I tried to relax and take a little break and try to stretch on the pole."
https://6abc.com/jogger-shocked-runner-traffic-light-utility-pole/1487092/
I believe this change is warranted. Metal light poles have unique characteristics that are not common to other pieces of equipment, and are in need of equipment protection."

I certainly have seen many cases where light poles' handhole covers have been vandalized and the wiring often messed with, putting at risk not only the fools who did this but also others who come along until maintenance crews make the time to restore the equipment yet again.

Is Class A GFCI protection warranted, or would GFPE be enough to protect against faults that may not be interrupted by normal safety grounding? CMP 18: The proposed addition of ground-fault protection for equipment does not address the electric shock hazard, which is addressed by proper grounding during installation. These concerns are best addressed by 210.8 and Article 680 requirements.

Related Item

• PI 992

Submitter Information Verification

Submitter Full Name: David Shapiro
Organization: Safety First Electrical
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 10 15:55:22 EDT 2021
Committee: NEC-P02

Public Comment No. 1301-NFPA 70-2021 [Section No. 210.8(F)]

~~**(F)** Outdoor Outlets.~~

~~For dwellings, all outdoor outlets rated 125 volts through 250 volts, including outlets installed in the following locations, and supplied by single-phase branch circuits rated 150 volts or less to ground, 50 amperes or less, shall be provided with GFCI protection:~~

(1) ~~Garages that have floors located at or below grade level~~

(2) ~~Accessory buildings~~

(3) ~~All outdoor outlets for dwellings other than those covered in 210.8(A), Exception No. 1~~

(4) ~~Boathouses~~

~~Where equipment supplied by an outlet covered under the requirements of this section is replaced, the outlet shall be supplied with GFCI protection.~~

~~*Exception: GFCI protection shall not be required on lighting outlets other than those covered in 210.8(C) .*~~

Retain the 2020 edition of the text.

Statement of Problem and Substantiation for Public Comment

With the proposed changes to 210.8(A) failing, the list items do not make sense. Furthermore, there was no substantiation to add GFCI requirements to Article 426 installations, nor was there substantiation to add it to luminaires.

Related Item

• FR 8865

Submitter Information Verification

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Submittal Date: Wed Aug 11 16:29:58 EDT 2021
Committee: NEC-P02

Public Comment No. 1425-NFPA 70-2021 [Section No. 210.8(F)]

~~(F) Outdoor Outlets.~~

~~For dwellings, all outdoor outlets rated 125 volts through 250 volts, including outlets installed in the following locations, and supplied by single-phase branch circuits rated 150 volts or less to ground, 50 amperes or less, shall be provided with GFCI protection:~~

(1) ~~Garages that have floors located at or below grade level~~

(2) ~~Accessory buildings~~

(3) ~~All outdoor outlets for dwellings other than those covered in 210.8(A), Exception No. 1~~

(4) ~~Boathouses~~

~~Where equipment supplied by an outlet covered under the requirements of this section is replaced, the outlet shall be supplied with GFCI protection.~~

~~*Exception: GFCI protection shall not be required on lighting outlets other than those covered in 210.8(C) .*~~

Statement of Problem and Substantiation for Public Comment

Leading Builders of America submitted a proposed Tentative Interim Amendment (TIA Log No.: 1589) several months ago. The TIA requested a delay in the enforcement of Section 210.8(F). At the time we acknowledged that there were no known solutions to address the concerns but we were under the impression that the HVAC manufacturers would have a resolution by January 1, 2023. However, based upon the progress to date and the status of a pending research project by AHRI, there still is no resolution nor is there a definitive timeframe when compatible equipment will be available in the marketplace, if at all.

Before submitting this Public Comment we reviewed the history of how Section 210.8(F) was included in the 2020 Edition of the NEC. Here is a brief summary of the documentation.

- Public Input 1206 proposed a new Section 210.8(F) citing three incidents, none of which involved HVAC equipment or dwelling units. The PI was resolved and CMP 2 noted that the submitted provided "insufficient details.....and justification for the change proposed."
- Public Comment 521 was submitted citing a single incident involving a fatality of a person accessing a property without authorization (jumping a fence) and landing on improperly installed HVAC equipment. The Public Comment resulted in Second Revision 7676.
- Second Revision 7676 passed ballot by one vote (10-4) with the Chair voting Negative, predicting that the change "will result in many unintended consequences", commenting that it is "unknown if AC units will operate on a GFCI protected circuit", and expressing concern over GFCI trips in high humidity and hot conditions.

Little did we know at that time the foresight that the past CMP2 Chair had when preparing his Negative ballot. It should also be noted that subsequent to this action we are not aware of any additional electrocution incidents involving equipment installed in accordance with prior editions of the NEC that did not contain the GFCI requirement.

With five TIA's submitted on this section it has been well documented that various types of HVAC equipment are causing the GFCI's to trip. The TIA's and the Public Comments received have clearly cited the increased risk to the occupants of dwelling units built in accordance with the 2020 Edition of the NEC due to the loss of cooling during high temperature conditions. Between 2004 and 2018, the CDC records indicate 10,527 heat related deaths (or a rate of 2/10,000 people). While not all of these deaths are related to nonfunctioning HVAC equipment, the TIA Public Comments clearly demonstrate that there have been more than one person killed as the result of nonfunctioning HVAC equipment.

CMP 2 also needs to consider what is happening at the State level during or after the adoption of the 2020 Edition of the NEC. Of the 13 states that have adopted or are substantially through the adoption process of the 2020 Edition of the NEC at the time this Public Comment was submitted, 6 states deleted the Section, 4 states have delayed enforcement of the Section, 2 states modified the Section by limiting the application, and only one state is currently enforcing the 2020 Edition without some modification or deletion of the Section. When MA adopted the 2020 Edition of the NEC, the Section was deleted saying:

"This addition in the 2020 NEC has not been substantiated. The loss experience supporting this addition to the NEC was based on untrained and unqualified work on an air-conditioning condenser that ended up energized and a thereby caused a boy who jumped a fence and contacted the housing to be-come electrocuted. GFCI protection saves countless lives and certainly has its place. However, it is a fool's errand to imply to the public that improper work can be rendered essentially safe by waving the GFCI magic wand. For example, contact between two circuit conductors will never trip a GFCI. CMP 2 came within one vote of rejecting this; Massachusetts needs to set it aside and await proper support."

This Public Comment requests that CMP 2 do the same thing that Massachusetts did, set the requirement aside and await proper support. Without additional justification regarding the electrocution risk associated with properly installed, listed HVAC equipment as compared to the risk associated with HVAC equipment failure and until a solution to resolve the incompatibility between listed HVAC equipment and listed GFCI's has been identified, the Section needs to be deleted from the NEC.

Related Item

• PI 570, PI 2610, PI2160

Submitter Information Verification

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Committee:	NEC-P02

Public Comment No. 1438-NFPA 70-2021 [Section No. 210.8(F)]

(F) Outdoor Outlets.

For dwellings, all outdoor outlets rated 125 volts through 250 volts, including outlets installed in the following locations, and supplied by single-phase branch circuits rated 150 volts or less to ground, 50 amperes or less, shall be provided with GFCI protection:

(1) Garages that have floors located at or below grade level

(2) Accessory buildings

(3) All outdoor outlets for dwellings other than those covered in 210.8(A), Exception No. 1

(4) Boathouses

<u>This requirement shall become effective January 1, 2026, for heating/ventilating/air-conditioning (HVAC) equipment.</u>

Where equipment supplied by an outlet covered under the requirements of this section is replaced, the outlet shall be supplied with GFCI protection.

Exception: GFCI protection shall not be required on lighting outlets other than those covered in 210.8(C).

Statement of Problem and Substantiation for Public Comment

Much work has been done to resolve the incompatibility issue between GFCIs and HVAC equipment, but it is not certain that all the details will be completed by the January 1, 2023 effective date in TIA 1593.

In addition, there is still a compatibility issue between GFCIs and single-stage condenser units to consider, which was documented by various home builders and HVAC manufacturers. It would be best to address this equipment, as well. If single-stage units continue to be linked to tripping incidents, it will make additional TIAs or other adjustments necessary in the future.

<u>Related Item</u>

• FR No. 8896

Submitter Information Verification

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Committee: NEC-P02

Public Comment No. 1461-NFPA 70-2021 [Section No. 210.8(F)]

(F) Outdoor Outlets.

For dwellings, all outdoor outlets rated 125 volts through 250 volts, including outlets installed in the following locations, and supplied by single-phase branch circuits rated 150 volts or less to ground, 50 amperes or less, shall be provided with GFCI protection:

(1) Garages that have floors located at or below grade level

(2) Accessory buildings

(3) All outdoor outlets for dwellings other than those covered in 210.8(A), Exception No. 1

(4) Boathouses

Where equipment supplied by an outlet covered under the requirements of this section is replaced, the outlet shall be supplied with GFCI protection.

Exception: GFCI protection shall not be required on lighting outlets other than those covered in 210.8(C).

Exception No 2: Ductless mini-split-type heating /ventilating/air-conditioning (HVAC) equipment and other HVAC units employing power conversion equipment as a means to control compressor speed.

Statement of Problem and Substantiation for Public Comment

Public Input No. 2160-NFPA 70--2020 [Section No. 210.8(F)] should have been accepted including the informational note. The committee statement said that this would exempt some types of HVAC equipment. That is exactly the point. It will exempt equipment that does not and was not intended to work with GFCI protection. Then the committee refers to "deaths" when the change accepted for the 2020 NEC was based on ONE death. That death was the result of other code violations. Existing violations of code requirements will not be corrected by writing more code requirements. But more importantly, there have been hundreds of deaths in 2021 alone that were the result of either not having air conditioning (or heating) or having air conditioning that does not work. The NEC should not be requiring people to go without AC just because their equipment is not compatible with GFCIs.

The same committee delayed requirements for GFCIs on refrigerators for many years until the listing standards and manufacturing could ensure that the refrigerators would operate without nuisance tripping of a GFCI. Similar allowances were provided for vending machines. Those allowances were not about deaths, they were about the cost and inconvenience of losing refrigerated products. This requirement in 210.8(F) could easily result in many deaths when the AC will not run due to tripping a GFCI, especially among people who will have to wait for someone to service the equipment. Then it should be considered how that equipment will be made to operate again. It is not likely that resetting the GFCI will do the trick. Instead, the GFCI is more likely to be eliminated if for no other reason than the risk to life and health is much greater due to excessive heat (or cold) than to an AC unit that is not GFCI protected.

The committee should also consider the many jurisdictions that have amended the 2020 requirement or not adopted the 2020 NEC at all due to regulations that simply do not work. They do not want installers to be guilty of a code violation when complying with the code has eliminated the necessary function of the HVAC equipment. The committee should consider that many jurisdictions do not enforce the NEC on residential construction but use the ICC Residental Code instead. ICC members have loudly noted the problems created by the 2020 NEC requirement in 210.8(F). The committee should consider that a rule that is not adopted by jurisdictions is a rule that will never be enforced.

Given that GFCIs do not work with some types of HVAC equipment, and when the GFCI trips it eliminates the critical equipment that is needed to save lives in some seasons and locations, the committee should amend the requirement in 210.8(F) until the critical HVAC equipment has been proven to be compatible with GFCI protection. In the drive to increase the efficiency of HVAC equipment, many new units incorporate variable speed compressors and the associated equipment that has not been intended to operate on a GFCI. Some deaths and injuries are caused by the failure of electrical equipment operate and not directly by exposure to electrical shock or arc flash. A decision to retain the rule without an exception implies the committee does not care about public safety issues or deaths except those caused by electrocution.

Please refer to https://www.tdlr.texas.gov/electricians/elecemgjust.htm for the amendment for Texas
Please refer to https://arvada.org/source/Building%20Inspection%20Division/DORA-Variance-Notice-GFCIs-and-Mechanical-Equipment.pdf for the amendment for Colorado

Related Item

• PI 2160-NFPA 70-2020

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Committee: NEC-P02

Public Comment No. 1856-NFPA 70-2021 [Section No. 210.8(F)]

(F) Outdoor Outlets.

For dwellings, all outdoor outlets rated 125 volts through 250 volts, including outlets installed in the following locations, and supplied by single-phase branch circuits rated 150 volts or less to ground, 50 amperes or less, shall be provided with GFCI protection:

(1) Garages that have floors located at or below grade level

(2) Accessory buildings

(3) All outdoor outlets for dwellings other than those covered in 210.8(A), Exception No. 1

(4) Boathouses

Where equipment supplied by an outlet covered under the requirements of this section is replaced, the outlet shall be supplied with GFCI protection.

Exception: GFCI protection shall not be required on lighting outlets other than those covered in 210.8(C).

<u>This requirement shall become effective on January 1, 2023 for mini-split-type heating/ventilating/air-conditioning (HVAC) equipment and other HVAC units employing power conversion equipment as a means to control compressor speed.</u>

<u>Informational Note: Power conversion equipment is the term used to describe the components used in HVAC equipment that is commonly referred to as a variable speed drive. The use of</u>

<u>power conversion equipment to control compressor speed differs from multistage compressor speed control.</u>

Statement of Problem and Substantiation for Public Comment

The new requirement is apparently causing unanticipated problems and can result in overly restrictive hardships for owners of existing and new HVAC equipment. Existing HVAC equipment has not been tested for leakage current to work with GFCI protection. Specifically, those that include power conversion equipment. Owners should not have to replace an existing AC unit that will not work with GFCI protection because a faulty breaker or disconnect needed replaced. Note that there are two tentative interim amendments in the works right now that will probably impact this Section in the 2023 NEC.

<u>Related Item</u>

• FR 8896

Submitter Information Verification

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Submittal Date: Wed Aug 18 11:33:19 EDT 2021
Committee: NEC-P02

Public Comment No. 2038-NFPA 70-2021 [Section No. 210.8(F)]

(F) Outdoor Outlets.

For dwellings, all outdoor outlets rated 125 volts through 250 volts, including outlets installed in the following locations, and supplied by single-phase branch circuits rated 150 volts or less to ground, 50 amperes or less, shall be provided with GFCI protection:

(1) Garages that have floors located at or below grade level

(2) Accessory buildings

(3) All outdoor outlets for dwellings other than those covered in 210.8(A), Exception No. 1

(4) Boathouses

Where equipment supplied by an outlet covered under the requirements of this section is replaced, the outlet shall be supplied with GFCI protection.

Exception No.1 : GFCI protection shall not be required on lighting outlets other than those covered in 210.8(C).

Exception No. 2: GFCI protection shall not be required for listed and labeled HVAC equipment.

Informational Note: See UL 60335-2-40, Household And Similar Electrical Appliances – Safety – Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers or UL 1995, Heating and Cooling Equipment for product safety standards.

Additional Proposed Changes

File Name	Description	Approved
AHRI_Substantiation_Images.docx	AHRI Substantiation Related Images	

Statement of Problem and Substantiation for Public Comment

The intent of this comment is to provide an exception for listed and labeled HVAC equipment from the GFCI outdoor outlet requirement in 210.8 (F). The GFCI requirement for outdoor outlets was added in the 2020 NEC edition. As explained in more detail below, the justification offered for including the GFCI was to provide increased protection against excessive leakage current that could lead to human electrocution.

AHRI strongly recommends that listed and labeled HVAC equipment should be exempted from GFCI outdoor outlet requirements for the following technical reasons:
1) there is a distinct difference between leakage current versus “touch” current that Class A GFCIs cannot differentiate
2) the historical safety of properly installed listed and labeled HVAC equipment (> 40 years for UL 1995 equipment) does not indicate the need for additional GFCI protection;
3) requiring GFCIs will put “at risk” populations at a greater fatality risk due to loss of heating or cooling
4) improper installations should not be the driver for code development; and
5) three out of the four negative comments of the 2020 NEC CMP-2 ballot noted the significant unintended consequences that would result from the broad implementation of GFCIs.

It is important to note that there is a difference between “leakage current” and “touch current.” IEC60990:2016 defines “TOUCH CURRENT” as “electric current through a human body or through an animal body when it touches one or more accessible parts of an installation or of EQUIPMENT.” Figure 5 from IEC60990:2016, reproduced below, shows a test setup and measurement network for touch current. (see attached figure#1)

Simplified Test Set-up (see attached figure#2)

Test results from several HVAC manufacturers indicate that touch current is significantly lower than current through a low impedance equipment grounding conductor. Class A GFCIs are unable to discern whether the current is flowing through a human body or a grounding conductor, and therefore trip under conditions that do not represent a threat to humans. The table below contrasts leakage current and touch current for three variable speed heat pumps.

Data supplied by two heat pump equipment manufacturers: test data for three variable speed heat pumps (see attached figure #3)

The data table above clearly shows that the touch current (noted above 0.6 mA – 1.58 mA) is well below the 5 mA letgo current, per IEC 60990:2016. Even at a leakage current of 32.85 mA (5-8 times the trip point for Class A GFCIs), the touch current is only 1.58 mA (less than 33% of the letgo current).

Properly grounded and bonded HVAC equipment (which are listed and labeled, code compliant equipment) WILL have significant levels of leakage current, but that is not the same as "touch current." Touch current is the leakage current a person experiences when leakage current flows through a human body (which has 500 - 2000 Ohm impedance). Touch current – rather than leakage current – is the REAL HAZARD to people.

Unfortunately, the inability of the Class A GFCI to differentiate between the two types of current (leakage current versus touch current) has caused serious unintended consequences. In states and jurisdictions across the country that have adopted this provision, there have been numerous incidents of GFCIs triggering “nuisance trips” of installed HVAC equipment. Most of these states have since taken steps to delete, modify, or delay this requirement to resolve the issue.

Results from the AHRI survey showing data by GFCI tripping are presented below. (see attached figure #4)

HVAC equipment complies with safety standards that have been in use for over 40 years.
Over 90% of HVAC equipment in use today is labeled and listed per UL 1995. These safety standards have ensured that products certified to them are safe. This safety is evidenced by the installation of more than 120 million HVAC units throughout the U.S. in the last twenty years without a documented fatality from equipment that was properly installed by qualified individuals per manufacturer's instructions. (i)

These existing HVAC safety standards focus on the true touch current hazard instead of the full leakage current in various operating modes and single fault conditions while also ensuring grounding resistance measurements under load.
Specifically:

- UL 1995 clauses 21, 22, 24, 54, 78 and 79 ensure grounding/earthing.
- UL 60335-2-40 sections 13 and 16 cover leakage/electrical strength, while section 27 covers earthing.

Further, AHRI notes that an incorrect installation and compressor fault caused the fatality that resulted in the creation of this section of the code. When Massachusetts rejected this section, they noted the following rationale:

"The loss experience supporting this addition to the NEC was based on untrained and unqualified work on an air-conditioning condenser that ended up energized and a thereby caused a boy who jumped a fence and contacted the housing to be-come electrocuted. GFCI protection saves countless lives and certainly has its place. However, it is a fool's errand to imply to the public that improper work can be rendered essentially safe by waving the GFCI magic wand. For example, contact between two circuit conductors will never trip a GFCI. CMP 2 came within one vote of rejecting this; Massachusetts needs to set it aside and await proper support." (ii)

The risk of electrocution has not been solved by 210.8(F), since the addition of an improperly installed GFCI could still result in a hazardous situation.

When this provision was first proposed through public input during the 2020 NEC code cycle, it did not address HVAC equipment. Rather, the three incidents initially cited were for non-HVAC equipment. The Code Making Panel 2 resolved the public input by stating that "insufficient details provided to permit root-cause analysis of the incidents cited and justification of the change proposed." (iii) A public comment was submitted to the First Draft report citing the single HVAC incident explained above and this comment drove the addition of this new requirement that was ultimately narrowly confirmed. (iv)

In fact, the Code Making Committee's own chairman went on record with the following comment of concern:

"The substantiation that resulted in the proposed revision was a result of an unqualified individual performing an electrical installation they never should have attempted to begin with and another individual that trespassed onto private property by jumping a fence and landing on top the enclosure for an air conditioner. Although this incident was certainly tragic, and I am on the side of safety, the NEC should not now mandate GFCI protection for all outdoor outlets based on set of very specific unfortunate circumstances. This requirement is extremely broad and therefore will result in many unintended consequences. For example, it is unknown if AC units will operate on a GFCI protected circuit as sufficient testing has not been conducted to answer this question. What if the AC unit is in an area where there is high humidity and hot conditions and the GFCI trips when the owners are not present for extended periods of time? This can result in interior property damage and unhealthy conditions from mold, etc. Because this requirement is not limited to receptacle outlets it will involve hard wired connections for effluent pumps and other types of lift station pumps with outdoor connections just to begin with." (v)

Unfortunately, the CMP chair's concerns could not have better described the current reality. States that originally adopted and enforced this provision quickly saw numerous instances of nuisance tripping across their jurisdictions, which ultimately required them to take immediate emergency action to suspend enforcement of this provision.

The proposed exception is urgently needed to prevent nuisance tripping that has and will continue to pose a serious health and safety risk. The sudden and unexpected loss of HVAC cooling in excessive heat due to a tripped GFCI breaker poses a danger to "at risk" populations. This ever-present risk presents a far greater threat to the public than the isolated incident that was used to justify the addition of 210.8 (F) to the 2020 NEC. The CDC statistics on heat-related deaths, provided below, show an annual average of 702 heat-related deaths in the U.S. from 2004 to 2018. (vi) (see figure #5)

AHRI strongly encourages the NFPA to include the proposed HVAC exception to resolve the unintended safety issue caused by the current GFCI requirement.

FOOTNOTES
i. AHRI, Central Air Conditioners and Air-Source Heat Pumps, https://ahrinet.org/resources/statistics/historical-data/central-air-conditioners-and-air-source-heat-pumps (showing the number of central air conditioners installed from 2001 to 2020).
ii. THE MASSACHUSETTS ELECTRICAL CODE 527 CMR 12.00 AS VOTED DECEMBER 5, 2019.
iii. 70_A2019_NEC_PI_Report_pg 4 of 25
iv. NFPA, NEC Second Draft FINAL Ballot Results (A2019 Cycle) (Jan. 30, 2019), available at https://www.nfpa.org/assets/files/AboutTheCodes/70/70_A2019_NEC_P02_SD_BallotFinal.pdf.
v. NFPA,NEC Second Draft FINAL Ballot Results (A2019 Cycle) (Jan. 30, 2019), available at https://www.nfpa.org/assets/files/AboutTheCodes/70/70_A2019_NEC_P02_SD_BallotFinal.pdf.
vi. Centers For Disease Control and Prevention, Morbidity and Mortality Weekly Report, Vol. 69, No. 24, pg. 732 (June 19, 2020), https://www.cdc.gov/mmwr/volumes/69/wr/pdfs/mm6924a1-H.pdf.

Related Item

- PI 570, PI 2610, PI2160

Submitter Information Verification

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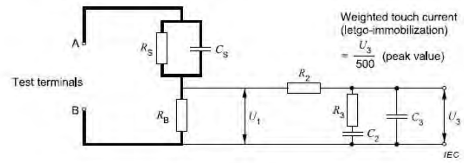
Committee:	NEC-P02

Figure 1



R_S	1 500 Ω	R_3	20 000 Ω
R_B	500 Ω	C_2	0,006 2 µF
C_S	0,22 µF	C_3	0,009 1 µF
R_2	10 000 Ω		

NOTE For special conditions on the use of this network, see 5.1.2.

Figure 5 – Measuring network, touch current weighted for letgo-immobilization

Figure 2

Simplified Test Set-up

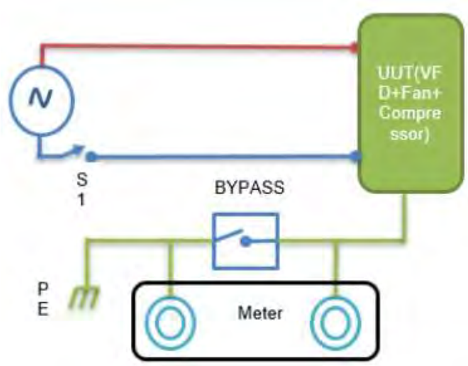


Figure 3

Data supplied by two heat pump equipment manufacturers: test data for three variable speed heat pumps

Current Through Protective Earth	Touch Current	Open Circuit Voltage
17.9 mA	0.6 mA	15.3 V
19.81 mA	0.85 mA	
32.85 mA	1.58 mA	

Figure 4

Survey data which shows number of calls/issues attributed to GFCI nuisance tripping for the following combinations:

Compressor Technology	System Type: Split System	System Type: Packaged Unit	System Type: Ductless Mini-Split
Single-Stage	100+	0	0
Two-Stage	16	0	0
Variable Speed	29	0	35

Figure 5

TABLE 1. Number and rate of heat-related deaths, by cause of death category,[*] age group, and sex — United States, 2004–2018[†]

Age group (yrs)	Cause of death category, no. (rate)[§]								
	Heat-related codes as the underlying cause			Heat-related codes as a contributing cause			All heat-related deaths		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
<1	160 (0.3)	76 (0.2)	84 (0.3)	87 (0.1)	43 (0.1)	44 (0.2)	247 (0.4)	119 (0.4)	128 (0.4)
1–4	303 (0.1)	178 (0.1)	125 (0.1)	125 (0.1)	76 (0.1)	49 (0.0)	428 (0.2)	254 (0.2)	174 (0.1)
5–14	56 (0.0)	42 (0.0)	14 (—)[¶]	17 (—)[¶]	14 (—)[¶]	3 (—)[¶]	73 (0.0)	56 (0.0)	17 (—)[¶]
15–24	234 (0.0)	203 (0.1)	31 (0.0)	94 (0.0)	77 (0.0)	17 (—)[¶]	328 (0.0)	280 (0.1)	48 (0.0)
25–34	430 (0.1)	378 (0.1)	52 (0.0)	230 (0.0)	195 (0.1)	35 (0.0)	660 (0.1)	573 (0.2)	87 (0.0)
35–44	670 (0.1)	550 (0.2)	120 (0.0)	352 (0.1)	287 (0.1)	65 (0.0)	1,022 (0.2)	837 (0.3)	185 (0.1)
45–54	1,090 (0.2)	874 (0.3)	216 (0.1)	684 (0.1)	533 (0.2)	151 (0.0)	1,774 (0.3)	1,407 (0.4)	367 (0.1)
55–64	1,024 (0.2)	762 (0.3)	262 (0.1)	895 (0.2)	658 (0.2)	237 (0.1)	1,919 (0.3)	1,420 (0.5	499 (0.2)
65–74	862 (0.2)	562 (0.3)	300 (0.2)	774 (0.2)	534 (0.3)	240 (0.1)	1,636 (0.4)	1,096 (0.7)	540 (0.3)
75–84	778 (0.4)	441 (0.5)	337 (0.3)	657 (0.3)	382 (0.4)	275 (0.2)	1,435 (0.7)	823 (1.0)	612 (0.5)
≥85	562 (0.7)	251 (0.9)	311 (0.5)	386 (0.5)	173 (0.6)	213 (0.4)	948 (1.1)	424 (1.5)	524 (0.9)
Not stated**	51 (N/A)	46 (N/A)	5 (N/A)	6 (N/A)	6 (N/A)	0 (N/A)	57 (N/A)	52 (N/A)	5 (N/A)
All ages	**6,220 (0.1)**	**4,363 (0.2)**	**1,857 (0.1)**	**4,307 (0.1)**	**2,978 (0.1)**	**1,329 (0.1)**	**10,527 (0.2)**	**7,341 (0.3)**	**3,186 (0.1)**

Abbreviation: N/A = not applicable.

* Heat-related deaths are identified using *International Classification of Diseases, Tenth Revision* cause-of-death codes X30 (exposure to excessive natural heat), P81.0 (environmental hyperthermia of newborn), and T67 (effects of heat and light) listed as the underlying cause or as one of the contributing causes in death records. Records with code W92 (exposure to excessive heat of man-made origin) listed anywhere on the death certificate were excluded from this selection.

† Based on multiple-cause-of-death data from the National Center for Health Statistics (NCHS) Vital Statistics System (https://www.cdc.gov/nchs/nvss/deaths.htm) and NCHS Bridged-Race Population data (https://www.cdc.gov/nchs/nvss/bridged_race.htm). This information is available from https://wonder.cdc.gov.

§ Crude rate per 100,000 population.

¶ Rate estimates based on fewer than 20 deaths were deemed unreliable and not reported.

** Rate estimates were not calculated because a population denominator was unavailable.

Public Comment No. 2065-NFPA 70-2021 [Section No. 210.8(F)]

(F) Outdoor Outlets.

For dwellings, all outdoor outlets rated 125 volts through 250 volts, including outlets installed in the following locations, and supplied by single-phase branch circuits rated 150 volts or less to ground, 50 amperes or less, shall be provided with GFCI protection:

(1) Garages that have floors located at or below grade level

(2) Accessory buildings

(3) All outdoor outlets for dwellings other than those covered in 210.8(A), Exception No. 1

(4) Boathouses

Where equipment supplied by an outlet covered under the requirements of this section is replaced, the outlet shall be supplied with GFCI protection.

Exception 1 : GFCI protection shall not be required on lighting outlets other than those covered in 210.8(C).

Exception 2: GFCI protection shall not be required for heating/ventilating/air-conditioning (HVAC) equipment which is connected to an overcurrent protected dedicated circuit.

Statement of Problem and Substantiation for Public Comment

For decades, ACCA members have been installing and maintaining HVAC equipment located outdoors in accordance with manufacturer's instructions and the National Electrical Code. Part of this installation involves connection to an overcurrent protected dedicated circuit device such as a fused or circuit breaker disconnect switch. Millions of installations across the country that were properly installed and inspected have prevented grounding incidents.

The addition of 210.8(F) has created the potential for a substantial number of nuisance trips nationwide due to the mismatched specifications between the UL standard for HVAC equipment and GFCI current leakage tolerances. This would result in safety and health issues associated with unnecessary loss of heating or cooling.

The above situation has led to many states either deleting or delaying this requirement when they adopted the 2020 NEC as their state codes.

- As of August 1, 2021, the 2020 NEC is in effect in 13 states, but 11 of those states have either modified or deleted 210.8(F) in response to the nuisance trip issue.

- 11 other states are processing adoption, and at least 3 of those states are taking action related to 210.8(F), specifically due to rendering such equipment inoperable in the field, and the resultant hazards associated with resetting the GFCI and living without cooling which for many consumers is a life and death situation. This overwhelming response is based on safety, not the market. Rendering equipment inoperable in the field raises a life and death situation with our population of sensitive elderly.

An overcurrent protected dedicated circuit, such as a fused disconnect switch or circuit breaker, is designed to open or disconnect the circuit when an overload or short-circuit occurs. When installing or maintaining equipment on the circuit, or the circuit itself, the disconnect switch provides a method to manually shut off the power. Therefore, requiring GFCI protection for those installations is unnecessary and creates an even greater safety hazard of inoperable equipment.

Related Item

- Public Input No. 2160

Submitter Information Verification

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Submittal Date:	Thu Aug 19 10:06:09 EDT 2021
Committee:	NEC-P02

Public Comment No. 2137-NFPA 70-2021 [Section No. 210.8(F)]

(F) Outdoor Outlets.

For dwellings, all outdoor outlets rated 125 volts through 250 volts, including outlets installed in the following locations, and supplied by single-phase branch circuits rated 150 volts or less to ground, 50 amperes or less, shall be provided with GFCI protection:

(1) Garages that have floors located at or below grade level

(2) Accessory buildings

(3) All outdoor outlets for dwellings other than those covered in 210.8(A), Exception No. 1

(4) Boathouses

~~Where equipment supplied by an outlet covered under the requirements of this section is replaced, the outlet shall be supplied with GFCI protection.~~

~~Exception~~

Exception (1) : GFCI protection shall not be required on lighting outlets other than those covered in 210.8(C) .

Exception (2) : GFCI protecftion shall not be required for HVAC systems using pulse modulation motor control or variable phase motor control.

Statement of Problem and Substantiation for Public Comment

I've commented extensively for the TIA's applicable to this section giving HVAC mini-split systems an exception.

These newer, highly efficient cooling and heating systems, are more effective and less costly than central air systems. I did the research regarding these systems in my own home by installing four of them, comparing power usage, cooling efficiency, and area effectiveness. The results confirm what several utilities and several states facing power shortages already know - that these mini split systems are very effective and install with minimal costs.

During the installation, I noted that the GFCI breaker for each 240VAC system (no neutral, only 2 hot wires plus ground as is common in compressor based systems) tripped IMMEDIATELY. After several days of analysis, here is what I found:
1) Power line monitors showed zero ground current and zero leakage current on the ground wire.
2) GFCI circuits were replaced several times just to make sure the breakers were not defective.
3) Using current probes, it was determined that the current between hot wire 1 and hot wire 2 (red and black) could phase shift by more than 8ms.
4) In order to remove any EMC/EMI component, a 40A multi-stage EMC filter was added in line. This filter removed any noise level on the hot wires in order to more effectively monitor current phasing or voltage deviations
5) Indeed, current phase delay can occur by as much as 75ma over an 8ms time period, and some cases more when the pump systems slows.

I then took a 2 pole circuit breaker apart ... the committee can just ask me for the pieces rather than spend the insane amount of money to do it themselves. This breaker uses a Fairchild / OnSemi component that has not changed in many years. the chip design doesn't look for phase relationships, it only looks for sensitivities in the gain amplifiers inside the chip to verify a grounding issue,. Because of this, the chip indicates a fault.

Contrary to what the manufacturers are telling you, this is a compatibility issue .... it is not leakage current. the chip used in these circuits needs to be redesigned. It is not as simple as adding an EMC/EMI filter as these manufactures argue. I have done that ... those filters just clean the noise so one skilled in the art can effectively see the problem.

It is the failure of the component used in the breaker to properly address phase delayed current and pulse modulated current control implementations.

I have requested in my TIA responses that the standards council hold off implementing this, and that a committee be formed to research and then properly address these concerns.

One skilled in the art will know that computer power supplies use this same method of control for driving efficiency in power conversion. In higher power systems using more than 20A,one can see the phase relationship moving out of bounds of the GFCI controller chip. Either the chip has to be redesigned, or these power efficient systems can no longer reach peak performance / peak efficiency.

The conclusion of my complete analysis is that present day GFCI systems are not compatible with technology developed over the last few years in power efficient cooling / heating systems.

Related Item

• FR8896

Submitter Information Verification

Submitter Full Name: Joel Goergen
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Submittal Date:	Thu Aug 19 13:35:49 EDT 2021
Committee:	NEC-P02

Public Comment No. 262-NFPA 70-2021 [Section No. 210.8(F)]

(F) Outdoor Outlets at Dwellings .

~~For dwellings, all outdoor outlets rated 125 volts through 250 volts, including outlets installed in~~ Outdoor outlets that are located at the following locations ~~, and~~ and are supplied by ~~single-phase~~ branch circuits ~~rated 150~~ rated 150 volts or less to ground, 50 amperes or less, shall be provided with GFCI protection:

(1) Dwellings

(2) Garages that have floors located at or below grade level

(3) Accessory buildings

(4) ~~All outdoor outlets for dwellings other than those covered in 210.8(A), Exception No. 1~~

(5) ~~Boathouses~~

~~Where~~

(1) Boathouses

If utilization equipment supplied by an outlet covered under the requirements of this section is replaced, the outlet shall be supplied with GFCI protection.

Exception: GFCI protection shall not be required ~~on lighting outlets other than those covered~~ for outlets as provided in 210.8(~~C~~ A)(3) Exception .

Statement of Problem and Substantiation for Public Comment

The addition of "at Dwellings" will clarify the application of this rule.
"Outlets" do not have voltage or ampere ratings. The term is defined in Article 100 as "A point on the wiring system at which current is taken to supply utilization equipment." That presents a problem unless the rule is revised to indicate the application is for the branch circuit that supplies the outlet.
The terms "125 volts through 250 volts" and "single-phase" are not necessary. The phrase "rated 150-volts or less to ground" is better as it clearly applies to branch circuits from 120/240-volt and 208Y/120-volt systems. Obviously, dwellings are commonly supplied by either of these systems.
The text in proposed list item (3) is not needed because the present language in 210.8(A) clearly applies.
(Sorry, the list is confused by the software.)

Related Item

• FR-8896

Submitter Information Verification

Submitter Full Name: Phil Simmons
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Submittal Date: Sun Jul 18 14:41:21 EDT 2021
Committee: NEC-P02

Public Comment No. 382-NFPA 70-2021 [Section No. 210.8(F)]

(F) Outdoor Outlets.

For dwellings, all outdoor outlets rated 125 volts through 250 volts, including outlets installed in the following locations, and supplied by single-phase branch circuits rated 150 volts or less to ground, 50 amperes or less, shall be provided with GFCI protection:

(1) Garages that have floors located at or below grade level

(2) Accessory buildings

(3) All outdoor outlets for dwellings other than those covered in 210.8(A), Exception No. 1

(4) Boathouses

Where equipment supplied by an outlet covered under the requirements of this section is replaced, the outlet shall be supplied with GFCI protection.

Exception: GFCI protection shall not be required on lighting outlets other than those covered in 210.8(C).

Additional Proposed Changes

File Name	Description	Approved
State_Of_Colorado_-_2020_GFCI_Breaker_Letter.pdf	Approved temporary variance for Colorado	

Statement of Problem and Substantiation for Public Comment

Proposals to apply a variance to this code for "mini-splits' have been beneficial for the operation of those units. However, I work in a technical support role for a Carrier Distributor and have comprised a list of standard A/C units that are experiencing nuisance trips with these style breakers. While the code is intended to protect against injury, it has so far cost the industry a substantial amount of time and money. In addition, consumers are left with inoperable equipment until the contractor can return and in most cases, replace the GFCI breaker with a standard breaker. Under severe conditions, this may pose a medical threat to the consumer.
In short, this code should not be enforced until the nuisance tripping can be resolved.

Related Item

• 210.8(F)

Submitter Information Verification

Submitter Full Name: Gregg Wells
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Submittal Date: Mon Jul 26 16:16:43 EDT 2021
Committee: NEC-P02

COLORADO
Department of Regulatory Agencies
Division of Professions and Occupations

To: Stakeholders, including but not limited to:
Counties/Municipalities, Electrical Contractors, Master Electricians

From: Colorado State Electrical Board

Date: June 29, 2021

Re: Temporary Variance – Article 210-8(F), 2020 NEC

Memorandum

On June 23, 2021, the State Electrical Board moved to grant a Temporary Variance to Article 210.8 (F) of the 2020 National Electrical Code as the Board found that:

1. The Electrical Board has received several inquiries and complaints regarding this code change, impacting ductless mini splits, and other relevant installations, causing GFCI tripping.

2. HVAC manufacturer's designs have a lower voltage for the power conversion equipment and controls, and in some cases, when using a control transformer, they use the equipment grounding conductor supplying the HVAC equipment for the grounded conductor return path, which is putting a large amount of power leakage current on the equipment ground.

3. Also, due to the use of the power conversion equipment, the change from AC to DC, and the ramping up and down in frequency, a leakage current could occur and be problematic.

Additional requirements/provisions:

1. This Temporary Variance will expire:

    a. One-year from the date the Board grants the request and will be revisited for extension if needed;

    b. If the National Fire Protection Association issues an applicable Tentative Interim Amendment; or,

    c. Upon the Board's adoption of the 2023 NEC.

For the Colorado State Electrical Board
Joyce J. Young
Program Director

Public Comment No. 251-NFPA 70-2021 [Section No. 210.8 [Excluding any Sub-Sections]]

A listed ~~Class A~~ GFCI shall provide protection in accordance with 210.8(A) through (F). The GFCI shall be installed in a readily accessible location.

Informational Note No. 1: See 215.9 for GFCI protection on feeders.

Informational Note No. 2: See 422.5(A) for GFCI requirements for appliances.

Informational Note No. 3: See 555.35(F) for GFCI requirements for boat hoists.

Informational Note No. 4: Additional GFCI requirements for specific circuits and equipment are contained in Chapters 4, 5, and 6.

For the purposes of this section, the distance from receptacles shall be measured as the shortest path the power supply cord connected to the receptacle would follow without piercing a floor, wall, ceiling, or fixed barrier.

Statement of Problem and Substantiation for Public Comment

Having "Class A GFCI" here but simply "GFCI" in the subsequent subsections or other sections of the NEC can cause unneeded confusion or mistakes due to the difference in wording. According to article 100, a GFCI operates at the threshold of a class A device. So it would seem GFCI is sufficient. If we are going to call for a class A GFCI here, then we likely should call for that everywhere in the NEC we call for a GFCI. Consistency and user friendliness in the NEC leads to more safe installations.

Related Item

- First Revision No. 8804-NFPA 70-2021 [Section No. 210.8 [Excluding any Sub-Sections]]

Submitter Information Verification

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Submittal Date: Thu Jul 15 21:01:25 EDT 2021
Committee: NEC-P02

Public Comment No. 1770-NFPA 70-2021 [Section No. 210.11(C)]

(C) Dwelling Units.

(1) Small-Appliance Branch Circuits.

In addition to the number of branch circuits required by other parts of this section, two or more 20-ampere small-appliance branch circuits shall be provided for all receptacle outlets specified by 210.52(B).

(2) Laundry Branch Circuits.

In addition to the number of branch circuits required by other parts of this section, at least one additional 20-ampere branch circuit shall be provided to supply the laundry receptacle outlet(s) required by 210.52(F). This circuit shall have no other outlets.

(3) Bathroom Branch Circuits.

In addition to the number of branch circuits required by other parts of this section, one or more 120-volt, 20-ampere branch circuit shall be provided to supply bathroom(s) receptacle outlet(s) required by 210.52(D) and any countertop and similar work surface receptacle outlets. Such circuits shall have no other outlets.

Exception: Where the 20-ampere circuit supplies a single bathroom, outlets for other equipment within the same bathroom shall be permitted to be supplied in accordance with 210.23(B)(1) and (A)(2).

(4) Garage Branch Circuits.

In addition to the number of branch circuits required by other parts of this section, at least one 120-volt, 20-ampere branch circuit shall be installed to supply receptacle outlets, including those required by 210.52(G)(1) for attached garages and in detached garages with electric power. This circuit shall have no other outlets.

Additional branch circuits rated 15 amperes or greater shall be permitted to serve receptacle outlets other than those required by 210.52(G)(1).

Exception No. 1: This circuit shall be permitted to supply outdoor receptacle outlets.

Exception No. 2: Where the 20-ampere circuit supplies a single vehicle bay garage, outlets for other equipment within the same garage shall be permitted to be supplied in accordance with 210.23(A)(1) and (A)(2).

(5) Bedrooms

In addition to the number of branch circuits required by other parts of this section, one or more 120-volt, 15-ampere branch circuit shall be provided to supply the receptacle outlet(s) in each Bedroom required by 210.52(A). Such circuits shall have no other outlets.

Statement of Problem and Substantiation for Public Comment

The change to the original PI is to utilize a dedicated 15A circuit in lieu of a 20A circuit in order for contractors to be able to utilize the same wiring and devices currently installed in the bedroom.

The load demand on bedroom receptacle outlets have become more critical especially during the COVID-19 pandemic to support remote / home office applications, home fitness equipment, and the trend to more in-home medical recovery and the use of Durable Medical Equipment (DME). Many homes are wired with 15A circuits in the bedroom that also supply the lighting in the room as well as multiple bedrooms. Home installed treadmills are very common today and their manufacturer's instructions require a 15A @ 120Vac dedicated circuit. This is seldom done and is one of the leading causes of overload customer service calls. If the home requires a hospital type bed that could take 6-10A itself thereby not providing additional load capacity. If Dialysis equipment is needed, the issue is even greater as the load requirements would be 20A between 2 motors. While these are the largest loads there are smaller DME loads that could add up. A CPAP is 2A, Oxygenator is 3A, and infusion pump is 1A. The load data came from various manufacturers documentation. These loads are in addition to the normal bedroom loads.

Customer Service Data reviewed from the last three years indicates that over 40% of customer phone calls related to residential circuit protection are a result of an overloaded circuit. The overload calls were almost 2 ½ times greater than the nearest other reason. This proposal seeks to address our documented concerns of homeowners where overloads have left them without power. These situations are simply due to poor design / installation based on the loads an individual home-owner may utilize establishing perceived 'nuisance' tripping events when the circuit was appropriately protected from an overload hazard.

Example:
Actual load measured for one-bedroom circuit with computer, monitors, ceiling fan, and table lamp along with other electronics loads. The reading is 4.41A. (Didn't turn on gaming console or radio) Three bedrooms on the same circuit which is currently permitted by the NEC would push the load on that 15A breaker over 80% for more than three hours. Simple math begins to demonstrate the driver of why the largest number of customer calls today are a result of an overloaded circuit.

Related Item

• FR 8963-NFPA 70-2021

Submitter Information Verification

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Submittal Date:	Tue Aug 17 17:14:11 EDT 2021
Committee:	NEC-P02

Public Comment No. 2180-NFPA 70-2021 [Section No. 210.12]

210.12 Arc-Fault Circuit-Interrupter Protection.

Arc-fault circuit-interrupter (AFCI) protection shall be installed in accordance with 210.12(B) through (F) by any of the means described in 210.12(A)(1) through (A)(6). The AFCI shall be listed and installed in a readily accessible location.

(A) Means of Protection.

AFCI protection shall be provided by any of the following means:

(1) A listed combination-type AFCI installed to provide protection of the entire branch circuit.

(2) A listed branch/feeder-type AFCI installed at the origin of the branch circuit in combination with a listed outlet-type branch-~~circuit-type AFCI~~ circuit AFCI installed at the first outlet ~~box on the branch circuit. The first outlet box in the branch circuit~~ box which shall be marked to indicate that it is the first outlet of the branch circuit.

(3) A listed supplemental arc protection circuit breaker installed at the origin of the branch circuit in combination with a listed outlet-type branch-circuit ~~-type~~ AFCI installed on the branch circuit at the first outlet box ~~on the branch circuit where~~ if all of the following conditions are met:

a. The branch-circuit wiring shall

~~be continuous~~
be unspliced and untapped from the branch-circuit overcurrent device to the outlet -type branch-circuit AFCI.

b. The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device to the first outlet shall not exceed 15.2 m (50 ft) for a 14 AWG copper conductor or 21.3 m (70 ft) for a 12 AWG copper conductor.

c. The first outlet box

~~in the branch circuit~~
shall be marked to indicate that it is the first outlet of the branch circuit.

~~A~~
(4) A listed outlet -type branch-circuit

~~-type~~
AFCI installed on the branch circuit at the first outlet

~~on the branch circuit~~
in combination with a listed branch-circuit overcurrent protective device

~~where~~
installed at the origin of the branch circuit if all of the following conditions are met:

a. The branch-circuit wiring shall be

~~continuous~~
unspliced and untapped from the branch-circuit overcurrent device to the outlet -type branch-circuit AFCI.

b. The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device to the first outlet shall not exceed 15.2 m (50 ft) for a 14 AWG copper conductor or 21.3 m (70 ft) for a 12 AWG copper conductor.

c. The first outlet box

~~in the branch circuit~~
shall be marked to indicate that it is the first outlet of the branch circuit.

d. The combination of the branch-circuit overcurrent device and the outlet -type branch-circuit AFCI shall be identified as meeting the requirements for a system combination-type AFCI and listed as such.

~~If metal raceway~~
(5) A listed outlet-type branch-circuit AFCI installed on the branch circuit at the first outlet to provide protection for the remaining portion of the branch circuit if the portion of branch circuit between the branch-circuit overcurrent protective device and the first outlet complies with applicable requirements of 250.118 for metal raceways , metal wireways, metal auxiliary gutters, or Type MC or Type AC

~~cable meeting the applicable requirements of~~ 250.118 ~~, with~~
cables and connects to metal boxes, metal conduit bodies, and metal enclosures

~~are installed for the~~

.

(6) A listed outlet-type branch-circuit AFCI installed on the branch circuit at te first outlet to provide protection for the reamining portion of the branch circuit if the portion of the branch circuit installed between the branch-circuit overcurrent device protective device and the first outlet

~~, it shall be permitted to install a listed outlet branch-circuit-type AFCI at the first outlet to provide protection for the remaining portion of the branch circuit.Where a~~
consists of listed metal or nonmetallic conduit or tubing or Type MC cable

~~is~~
encased in not less than 50 mm (2 in.) of concrete

~~for the portion of the branch circuit between the branch-circuit overcurrent device and the first outlet, it shall be permitted to install a listed~~

.

Informational Note: See *ANSI/UL 1699-* 2020, *Standard for Arc-Fault Circuit-Interrupters* , for information on combination-type and branch/feeder-type AFCI devices. See UL Subject 1699A, *Outline of Investigation for Outlet Branch Circuit Arc-Fault Circuit-Interrupters* , for information on outlet branch-circuit

~~-type AFCI at the first outlet to provide protection for the remaining portion of the branch circuit~~
type AFCI devices. See UL Subject 1699C, *Outline of Investigation for System Combination Arc-Fault Circuit Interrupters* , for information on system combination AFCIs .

(B) Dwelling ~~Units~~ Unit Locations .

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) Kitchens

(2) Family rooms

(3) Dining rooms

(4) Living rooms

(5) Parlors

(6) Libraries

(7) Dens

(8) Bedrooms

(9) Sunrooms

(10) Recreation rooms

(11) Closets

(12) Hallways

(13) Laundry areas

(14) ~~Similar areas~~

Exception No. 1: AFCI protection shall not be required for an individual branch circuit supplying a fire alarm system installed in accordance with 760.41(B) or 760.121(B). The branch circuit shall ~~be installed in a metal raceway~~ comply with applicable requirements of 250.118 for metal raceways , metal auxiliary ~~gutter~~ gutters , ~~steel-armored cable,~~ or Type MC or Type AC ~~cable meeting the applicable requirements of 250.118 , with~~ cables and connects to metal boxes, metal conduit bodies, and metal enclosures.

Exception No. 2: AFCI protection shall not be required for the individual branch circuit supplying ~~a receptacle~~ an outlet for arc welding equipment in a dwelling unit ~~effective~~ until January 1, 2025 and after .

Informational Note No. 1: See

~~UL 1699-2011, *Standard for Arc-Fault Circuit-Interrupters* , for information on combination-type and branch/feeder-type AFCI devices. See UL Subject 1699A, *Outline of Investigation for Outlet Branch Circuit Arc-Fault Circuit-Interrupters* , for information on outlet branch-circuit type AFCI devices. See UL Subject 1699C, *Outline of Investigation for System Combination Arc-Fault Circuit Interrupters* , for information on system combination AFCIs.~~

~~Informational Note No. 2: See~~ 29.9.4(5) of *NFPA 72*-2019, *National Fire Alarm and Signaling Code*, for information on secondary power source requirements for smoke alarms installed in dwelling units.

Informational Note No. ~~3~~ 2 : See 760.41(B) and 760.121(B) for power source requirements for fire alarm systems.

(C) Dormitory ~~Units~~ Unit Locations .

All 120-volt, single-phase, 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) Bedrooms

(2) Living rooms

(3) Hallways

(4) Closets

(5) Bathrooms

(6) ~~Similar rooms~~

(D) **Locations in** Other Occupancies.

All 120-volt, single-phase, 15- and 20-ampere branch circuits supplying outlets or devices installed in ~~guest rooms and guest suites of hotels and motels, and in areas used exclusively as patient sleeping rooms in nursing homes and limited-care facilities~~ 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

(E) Branch Circuit Extensions or Modifications.

Where branch-circuit wiring for any of the areas specified in 210.12(B), (C), or (D) is modified, replaced, or extended, the branch circuit shall be protected by one of the following:

(1) By any of the means described in 210.12(A)(1) through (A)(6)

(2) A listed outlet branch-circuit-type AFCI located at the first receptacle outlet of the existing branch circuit

Exception: AFCI protection shall not be required where the extension of the existing branch-circuit conductors is not more than 1.8 m (6 ft) and does not include any additional outlets or devices, other than splicing devices. This measurement shall not include the conductors inside an enclosure, cabinet, or junction box.

(F) Sleeping Quarters.

All 120-volt, single-phase, 15 and 20-ampere branch circuits supplying outlets or devices installed in rooms designed exclusively for sleeping in fire houses, rescue squads, police departments, and similar locations shall be protected by any of the means described in 210.12(A)(1) through (A)(6).

Additional Proposed Changes

File Name	Description	Approved
PUBLIC_COMMENT_No_2180_to_First_Revision_No._9158-NFPA_70-2021_Detail_.docx	PUBLIC COMMENT No, 2180 to First Revision No. 9158-NFPA 70-2021 [Detail]	

Statement of Problem and Substantiation for Public Comment

To address NEC® Style Manual issues: some existing 210.12 requirements (made obvious by reorganization of 210.12) and newly restated requirements (introduced by that reorganization) are not compliant with the NEC® Style Manual and therefore must be corrected.

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• Except for branch/feeder AFCI of 210.12(A)(2), all other AFCIs of 210.12(A) are branch-circuit AFCIs. Consequently, the term “outlet branch-circuit-type AFCI” in list items (3), (4), (5) and (6) is inaccurate and confusing as a description of AFCI protection located at an outlet; therefore replace “outlet branch-circuit-type AFCI” with “outlet-type branch-circuit AFCI” throughout. If this were not the situation, then the term should have been also hyphenated as “outlet-branch-circuit-type”; “outlet-branch-circuit” is as incorrect as an adjective as “outlet-branch circuit” would be as a noun. We don’t after all have “branch-circuit-type overcurrent protective devices” or “branch-circuit-type wiring”. (Alternatively, delete “-type” entirely from 210.12.)

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• 210.12(A) first-level list items (1), (2), (5) and (6) do not conform with 2020 NEC® Style Manual 3.3.5.3 “All items in a list should be parallel (… written … using phrases or sentences but not a mix)”; delete periods.

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• 210.12(A)(3), 210.12(A)(4) and 210.12(A)(6) do not conform with 2020 NEC® Style Manual 3.3.4 for word clarity using “where” instead of correct “if” for conditions.

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• 210.12(A)(3)(a) and 210.12(A)(4)(a) use the ambiguous term “continuous”; spliced or tapped conductors are electrically continuous. Replace “continuous” with “unspliced and untapped” to conform with 2020 NEC® Style Manual 3.3.4 for word clarity (“… specific and clear in meaning …”) to avoid confusion with separate lengths of conductors joined electrically by splicing wire connectors or terminals somewhere between the branch-circuit overcurrent device and the outlet branch-circuit-type AFCI.

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• 210.12(A)(3)(b) and 210.12(A)(4)(b) do not correlate with 110.5; add “copper” following each “AWG” and ahead of each “conductor” to conform with 2020 NEC® Style Manual 3.3.4 for word clarity (“… specific and clear in meaning …”) to avoid confusion with those AWG wire sizes in aluminum or copper-clad aluminum conductors.

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• 210.12 charging text effectively defines the MEANS of protection as “the means described in 210.12(A)(1) through (A)(6)”. While 210.12(A)(1) through (A)(4) are requirements mandating specific device types since the 2014 NEC®, 210.12(A)(5) and (A)(6) MEANS of protection have been PERMISSIVE ALLOWANCES (“… it SHALL BE PERMITTED TO INSTALL a listed outlet branch-circuit-type AFCI installed at the first outlet …”) that ALLOW an OBC AFCI device to achieve each of those MEANS of protection IN LIEU OF PROTECTION PROVIDED BY:

\- those Chapter 3 wiring methods complying applicable EGC requirements of 250.118 FOR METAL RACEWAYS, METAL WIREWAYS, METAL AUXILIARY GUTTERS, or Type MC or Type AC CABLES, and

\- several Chapter 3 wiring methods (metal or nonmetallic conduit or tubing or Type MC cable) encased in a 2-inch minimum thickness of concrete

Since 210.12(A)(5) and 210.12(A)(6) are alternative MEANS of protection to those MEANS of 210.12(A)(1) through (A)(4) requiring AFCI circuit breakers, and since for 210.12(A)(5) and 210.12(A)(6) it’s merely PERMISSIVE TO INSTALL an OBC AFCI at the first outlet, then neither an OBC AFCI nor an AFCI circuit breaker is MANDATED to achieve 210.12 MEANS of protection for 210.12(A)(5) and 210.12(A)(6). By deviating from 2020 NEC® Style Manual 3.1.2 (improper use of Permissive Rule) and 2020 NEC® Style Manual 3.3.5., CMP-2’s use of permissive “shall be permitted to be installed” wording in 210.12(A)(5) and 210.12(A)(6) negates the “shall be installed” mandatory use of any AFCI device whatsoever to attain MEANS of AFCI protection. Of course, the other alternative for NEC® Style Manual consistency would be to revise 210.12(A)(1) through (A)(4) to specify “shall be permitted to be installed” wording and as complete sentences for each list item.

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• 210.12(A) addresses the MEANS of AFCI protection whereas 210.12(B) addresses the LOCATIONS of a dwelling unit required to have AFCI protection. The FR does not comply with 2020 NEC® Style Manual 3.1.3 (Informational notes contain explanatory information and shall be located directly after the rule they apply to). Accordingly, relocate 210.12(B) Informational Note No 1 pertaining to the MEANS of AFCI protection directly after 210.12(A) as 210.12(A) Informational Note and renumber 210.12(B) Informational Note No 2 and 210.12(B) Informational Note No 3 in-place as 210.12(B) Informational Note No 1 and 210.12(B) Informational Note No 2, respectively.

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• In 210.12(A) Informational Note, the cited standard UL 1699-2011 is now designated as ANSI/UL 1699-2020.

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• 210.12(B) main rule addresses “locations” of a dwelling unit having AFCI protection; the title to 210.12(B) should accordingly reflect that purpose.

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• The use of the undefined, vague term “similar areas” as 210.12(B)(14) violates with 2020 NEC® Style Manual 3.2.1 and Table 3.2.1 for unenforceable terms.

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• 210.12(B) Exception No 1 is revised as an exception for wording commonality with 210.12(A)(5).

.

• 210.12(B) Exception No 2, as it’s presently written, mandates AFCI protection on said circuit supplying arc welding equipment for solely one day, New Year’s Day 2025. On January 2, 2025, the exception as written again permits no AFCI protection on said circuit. Even with correction of the time expression, 210.12(B) Exception No 2 is NOT written as an exception to the rule but as merely a redundant restatement of the rule. Furthermore, the main rule requires AFCI protection of “outlets or devices”, so the exception should negate that rule for “an outlet”, not “a receptacle”.

.
• 210.12(C) main rule addresses “locations” of a dormitory unit having AFCI protection; the title to 210.12(C) should accordingly reflect that purpose.
.
• The use of the undefined, vague term “similar areas” as 210.12(C)(6) violates with 2020 NEC® Style Manual 3.2.1 and Table 3.2.1 for unenforceable terms.
.
• 210.12(D) main rule addresses “locations” of other occupancies having AFCI protection; the title to 210.12(D) should accordingly reflect that purpose.
.
• 210.12(D) main rule duplicates “locations” in other occupancies having AFCI protection appearing in list items (1) and (2) of 210.12(D); replace with “following locations” in the main rule.

Related Item

• First Revision No. 9158-NFPA 70-2021 [Detail]

Submitter Information Verification

Submitter Full Name:	Brian Rock
Organization:	Hubbell Incorporated
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Thu Aug 19 15:57:50 EDT 2021
Committee:	NEC-P02

PUBLIC COMMENT No, 2180 to First Revision No. 9158-NFPA 70-2021 [Detail]

Submitter: **Brian E. Rock**

Company: **Hubbell Incorporated**

Comment including proposed new or revised wording, or identification of wording to be deleted, in legislative format; i.e., <u>underscore</u> denotes inserted wording and ~~strike-through~~ indicates deleted wording:

210.12 Arc-Fault Circuit-Interrupter Protection.

Arc-fault circuit-interrupter (AFCI) protection shall be installed in accordance with 210.12(B) through (E) by any of the means described in 210.12(A)(1) through (A)(6). The AFCI shall be listed and installed in a readily accessible location.

(A) Means of Protection.

AFCI protection shall be provided by any of the following means:

(1) A listed combination-type AFCI installed to provide protection of the entire branch circuit~~.~~

(2) A listed branch/feeder-type AFCI installed at the origin of the branch-circuit in combination with a listed outlet<u>-type</u> branch-circuit~~-type~~ AFCI installed <u>on the branch circuit</u> at the first outlet box ~~on the branch circuit.~~, ~~The first outlet box in the branch circuit~~ <u>which</u> shall be marked to indicate that it is the first outlet of the <u>branch</u> circuit~~.~~

(3) A listed supplemental arc protection circuit breaker installed at the origin of the branch circuit in combination with a listed outlet<u>-type</u> branch-circuit~~-type~~ AFCI installed <u>on the branch circuit</u> at the first outlet box ~~on the branch circuit~~ ~~where~~ <u>if</u> all of the following conditions are met:

a. The branch-circuit wiring shall be ~~continuous~~ <u>unspliced and untapped</u> from the branch-circuit overcurrent device to the outlet<u>-type</u> branch-circuit AFCI.

b. The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device to the first outlet shall not exceed 15.2 m (50 ft) for a 14 AWG <u>copper</u> conductor or 21.3 m (70 ft) for a 12 AWG <u>copper</u> conductor. \

c. The first outlet box ~~in the branch circuit~~ shall be marked to indicate that it is the first outlet of the <u>branch</u> circuit.

(4) A listed outlet<u>-type</u> branch-circuit~~-type~~ AFCI installed <u>on the branch circuit</u> at the first outlet ~~on the branch circuit~~ in combination with a listed branch-circuit overcurrent protective device <u>installed at the origin of the branch circuit</u> ~~where~~ <u>if</u> all of the following conditions are met:

a. The branch-circuit wiring shall be ~~continuous~~ <u>unspliced and untapped</u> from the branch-circuit overcurrent device to the outlet<u>-type</u> branch-circuit AFCI.

b. The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device to the first outlet shall not exceed 15.2 m (50 ft) for a 14 AWG copper conductor or 21.3 m (70 ft) for a 12 AWG copper conductor. \

c. The first outlet box ~~in the branch circuit~~ shall be marked to indicate that it is the first outlet of the branch circuit.

d. The combination of the branch-circuit overcurrent device and the outlet-type branch-circuit AFCI shall be identified as meeting the requirements for a system combination-type AFCI and shall be listed as such.

(5) A listed outlet-type branch-circuit AFCI installed on the branch circuit at the first outlet to provide protection for the remaining portion of the branch circuit if the portion of the branch circuit installed between the branch-circuit overcurrent protective device and the first outlet complies with applicable requirements of 250.118 for metal raceways, metal wireways, metal auxiliary gutters, or Type MC or Type AC cables ~~meeting applicable requirements of 250.118,~~ and connects to ~~with~~ metal boxes, metal conduit bodies, and metal enclosures ~~are installed for the portion of the branch circuit between the branch-circuit overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit-type AFCI installed at the first outlet to provide protection for the remaining portion of the branch circuit.~~

(6) A listed outlet-type branch-circuit AFCI installed on the branch circuit at the first outlet to provide protection for the remaining portion of the branch circuit if the portion of the branch circuit installed between the branch-circuit overcurrent protective device and the first outlet consists of ~~Where a~~ listed metal or nonmetallic conduit or tubing or Type MC cable ~~is~~ encased in not less than 50 mm (2 in.) of concrete ~~for the portion of the branch circuit between the branch-circuit overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit-type AFCI installed at the first outlet to provide protection for the remaining portion of the branch circuit.~~

Informational Note: See *ANSI/UL 1699-2020*, *Standard for Arc-Fault Circuit Interrupters*, for information on combination-type and branch/feeder-type arc-fault circuit interrupters. For information on outlet branch-circuit type arc-fault circuit interrupters, see *UL Subject 1699A, Outline of Investigation for Outlet Branch Circuit Arc-Fault Circuit-Interrupters*. For information on system combination AFCIs, see UL *Subject 1699C, Outline of Investigation for System Combination Arc-Fault Circuit Interrupters*.

(B) Dwelling Unit Locations.

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) Kitchens

(2) Family rooms

(3) Dining rooms

(4) Living rooms

(5) Parlors

(6) Libraries

(7) Dens

(8) Bedrooms

(9) Sunrooms

(10) Recreation rooms

(11) Closets

(12) Hallways

(13) Laundry rooms

~~(14) Similar areas~~

Exception No. 1: AFCI protection shall not be required for an individual branch circuit supplying a fire alarm system installed in accordance with 760.41(B) or 760.121(B). The branch circuit shall ~~be installed in a~~ comply with applicable requirements of 250.118 for metal raceways, metal auxiliary gutters, ~~steel-armored cable,~~ or Type MC or Type AC cables ~~meeting the applicable requirements of 250.118~~, ~~with~~ and connects to metal boxes, metal conduit bodies, and metal enclosures.

Exception No. 2: AFCI protection shall not be required for an individual branch circuit supplying ~~a receptacle~~ an outlet for arc welding equipment in a dwelling unit ~~effective~~ until January 1, 2025 and after.

~~Informational Note No.1: See UL 1699-2011, *Standard for Arc-Fault Circuit Interrupters*, for information on combination-type and branch/feeder-type arc-fault circuit interrupters. For information on outlet branch-circuit type arc-fault circuit interrupters, see *UL Subject 1699A, Outline of Investigation for Outlet Branch Circuit Arc-Fault Circuit-Interrupters*. For information on system combination AFCIs, see *UL Subject 1699C, Outline of Investigation for System Combination Arc-Fault Circuit Interrupters*.~~

Informational Note No.~~2~~1: See 29.9.4(5) of *NFPA 72-2019*, *National Fire Alarm and Signaling Code*, for information on secondary power source requirements for smoke alarms installed in dwelling units.

Informational Note No.~~3~~2: See 760.41(B) and 760.121(B) for power source requirements for fire alarms.

(C) Dormitory Unit Locations.

All 120-volt, single-phase, 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) Bedrooms

(2) Living rooms

(3) Hallways

(4) Closets

(5) Bathrooms

~~(6) Similar areas~~

(D) <u>Locations in</u> Other Occupancies.

All 120-volt, single-phase, 15- and 20-ampere branch circuits supplying outlets or devices installed in ~~guest rooms and guest suites of hotels and motels and in areas used exclusively as patient sleeping rooms in nursing homes and limited care facilities~~ <u>the following locations</u> 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

(E) and **(F)** unchanged from First Draft.

Statement of Problem and Substantiation for Comment:

To address *NEC® Style Manual* issues: some existing 210.12 requirements (made obvious by reorganization of 210.12) and newly restated requirements (introduced by that reorganization) are not compliant with the *NEC® Style Manual* and therefore must be corrected.

- Except for branch/feeder AFCI of 210.12(A)(2), all other AFCIs of 210.12(A) are branch-circuit AFCIs. Consequently, the term “outlet branch-circuit-type AFCI” in list items (3), (4), (5) and (6) is inaccurate and confusing as a description of AFCI protection located at an outlet; therefore replace “outlet branch-circuit-type AFCI” with “outlet-type branch-circuit AFCI” throughout. If this were not the situation, then the term should have been also hyphenated as “outlet-branch-circuit-type”; “outlet-branch-circuit” is as incorrect as an adjective as “outlet-branch circuit” would be as a noun. We don’t after all have “branch-circuit-type overcurrent protective devices” or “branch-circuit-type wiring”. (Alternatively, delete “-type” entirely from 210.12.)
- 210.12(A) first-level list items (1), (2), (5) and (6) do not conform with 2020 *NEC® Style Manual* 3.3.5.3 “All items in a list should be parallel (… written … using phrases or sentences but not a mix)”; delete periods.
- 210.12(A)(3), 210.12(A)(4) and 210.12(A)(6) do not conform with 2020 *NEC® Style Manual* 3.3.4 for word clarity using “where” instead of correct “if” for conditions.
- 210.12(A)(3)(a) and 210.12(A)(4)(a) use the ambiguous term “continuous”; spliced or tapped conductors are electrically continuous. Replace “continuous” with “unspliced and untapped” to conform with 2020 *NEC® Style Manual* 3.3.4 for word clarity (“… specific and clear in meaning …”) to avoid confusion with separate lengths of conductors joined electrically by splicing wire connectors or terminals somewhere between the branch-circuit overcurrent device and the outlet branch-circuit-type AFCI.
- 210.12(A)(3)(b) and 210.12(A)(4)(b) do not correlate with 110.5; add “copper” following each “AWG” and ahead of each “conductor” to conform with 2020 *NEC® Style Manual* 3.3.4 for word clarity (“… specific and clear in meaning …”) to avoid confusion with those AWG wire sizes in aluminum or copper-clad aluminum conductors.
- 210.12 charging text effectively defines the MEANS of protection as “the means described in 210.12(A)(1) through (A)(6)”. While 210.12(A)(1) through (A)(4) are requirements mandating specific device types, since the 2014 NEC®, 210.12(A)(5) and (A)(6) MEANS of protection have been

PERMISSIVE ALLOWANCES ("… it SHALL BE PERMITTED TO INSTALL a listed outlet branch-circuit-type AFCI installed at the first outlet …") that ALLOW an OBC AFCI device to achieve each of those MEANS of protection IN LIEU OF PROTECTION PROVIDED BY:

- those Chapter 3 wiring methods complying applicable EGC requirements of 250.118 FOR METAL RACEWAYS, METAL WIREWAYS, METAL AUXILIARY GUTTERS, or Type MC or Type AC CABLES, and
- several Chapter 3 wiring methods (metal or nonmetallic conduit or tubing or Type MC cable) encased in a 2-inch minimum thickness of concrete

Since 210.12(A)(5) and 210.12(A)(6) are alternative MEANS of protection to those MEANS of 210.12(A)(1) through (A)(4) requiring AFCI circuit breakers, and since for 210.12(A)(5) and 210.12(A)(6) it's merely PERMISSIVE TO INSTALL an OBC AFCI at the first outlet, then neither an OBC AFCI nor an AFCI circuit breaker is MANDATED to achieve 210.12 MEANS of protection for 210.12(A)(5) and 210.12(A)(6). By deviating from 2020 *NEC® Style Manual* 3.1.2 (improper use of Permissive Rule) and 2020 *NEC® Style Manual* 3.3.5., CMP-2's use of permissive "shall be permitted to be installed" wording in 210.12(A)(5) and 210.12(A)(6) negates the "shall be installed" mandatory use of <u>any</u> AFCI device whatsoever to attain MEANS of AFCI protection. Of course, the other alternative for *NEC® Style Manual* consistency would be to revise 210.12(A)(1) through (A)(4) to specify "shall be permitted to be installed" wording and as complete sentences for each list item.

- 210.12(A) addresses the MEANS of AFCI protection whereas 210.12(B) addresses the LOCATIONS of a dwelling unit required to have AFCI protection. The FR does not comply with 2020 *NEC® Style Manual* 3.1.3 (Informational notes contain explanatory information and shall be located directly after the rule they apply to). Accordingly, relocate 210.12(B) Informational Note No 1 pertaining to the MEANS of AFCI protection directly after 210.12(A) as 210.12(A) Informational Note and renumber 210.12(B) Informational Note No 2 and 210.12(B) Informational Note No 3 in-place as 210.12(B) Informational Note No 1 and 210.12(B) Informational Note No 2, respectively.
- In 210.12(A) Informational Note, the cited standard *UL 1699-2011* is now designated as *ANSI/UL 1699-2020*.
- 210.12(B) main rule addresses "locations" of a dwelling unit having AFCI protection; the title to 210.12(B) should accordingly reflect that purpose.
- The use of the undefined, vague term "similar areas" as 210.12(B)(14) violates with 2020 *NEC® Style Manual* 3.2.1 and Table 3.2.1 for unenforceable terms.
- 210.12(B) Exception No 1 is revised as an exception for wording commonality with 210.12(A)(5).
- 210.12(B) Exception No 2, as it's presently written, mandates AFCI protection on said circuit supplying arc welding equipment for solely one day, New Year's Day 2025. On January 2, 2025, the exception as written again permits no AFCI protection on said circuit. Even with correction of the time expression, 210.12(B) Exception No 2 is NOT written as an exception to the rule but as merely a redundant restatement of the rule. Furthermore, the main rule requires AFCI protection of "outlets or devices", so the exception should negate that rule for "an outlet", not "a receptacle".
- 210.12(C) main rule addresses "locations" of a dormitory unit having AFCI protection; the title to 210.12(C) should accordingly reflect that purpose.
- The use of the undefined, vague term "similar areas" as 210.12(C)(6) violates with 2020 *NEC® Style Manual* 3.2.1 and Table 3.2.1 for unenforceable terms.
- 210.12(D) main rule addresses "locations" of other occupancies having AFCI protection; the title to 210.12(D) should accordingly reflect that purpose.
- 210.12(D) main rule duplicates "locations" in other occupancies having AFCI protection appearing in list items (1) and (2) of 210.12(D); replace with "following locations" in the main rule.

Public Comment No. 1767-NFPA 70-2021 [Section No. 210.12(A)]

(A) Means of Protection.

AFCI protection shall be provided by any of the following means:

(1) A listed combination-type AFCI installed to provide protection of the entire branch circuit.

(2) A listed branch/feeder-type AFCI installed at the origin of the branch circuit in combination with a listed outlet branch-circuit-type AFCI installed at the first outlet box on the branch circuit. The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.

(3) A listed supplemental arc protection circuit breaker installed at the origin of the branch circuit in combination with a listed outlet branch-circuit-type AFCI installed at the first outlet box on the branch circuit where all of the following conditions are met:

a. The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit AFCI.

b. The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device to the first outlet shall not exceed 15.2 m (50 ft) for a 14 AWG conductor or 21.3 m (70 ft) for a 12 AWG conductor.

c. The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.

(4) A listed outlet branch-circuit-type AFCI installed at the first outlet on the branch circuit in combination with a listed branch-circuit overcurrent protective device where all of the following conditions are met:

a. The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit AFCI.

b. The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device to the first outlet shall not exceed 15.2 m (50 ft) for a 14 AWG conductor or 21.3 m (70 ft) for a 12 AWG conductor.

c. The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.

d. The combination of the branch-circuit overcurrent device and outlet branch-circuit AFCI shall be identified as meeting the requirements for a system combination-type AFCI and listed as such.

(5) A listed outlet branch-circuit-type AFCI installed at the first outlet box on the branch circuit in combination with a listed branch-circuit overcurrent protective device where all of the following conditions are met:

a. The branch-circuit wiring shall be unspliced and untapped from the branch-circuit overcurrent device to the outlet branch-circuit AFCI.

b. The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device to the first outlet shall not exceed 15.2 m (50 ft) for a 14 AWG copper conductor or 21.3 m (70 ft) for a 12 AWG copper conductor.

c. The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.

d. The minimum transformer rating supplying the service shall be 25 kVA.

e. The maximum service conductor length from the transformer to the service equipment installed in other than ferro-magnetic conduit shall not exceed 38 m (125 ft) with minimum 3/0 aluminum conductor or 22.9 m (75 ft) with minimum 1/0 aluminum conductor

f. The branch circuit overcurrent protective device shall be a listed single pole thermo-magnetic breaker.

(6). If metal raceway, metal wireways, metal auxiliary gutters, or Type MC or Type AC cable meeting the applicable requirements of 250.118 , with metal boxes, metal conduit bodies, and metal enclosures are installed for the portion of the branch circuit between the branch-circuit overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit-type AFCI at the first outlet to provide protection for the remaining portion of the branch circuit.

(7). Where a listed metal or nonmetallic conduit or tubing or Type MC cable is encased in not less than 50 mm (2 in.) of concrete for the portion of the branch circuit between the branch-circuit overcurrent device and the first outlet, it shall be permitted to install a listed outlet branch-circuit-type AFCI at the first outlet to provide protection for the remaining portion of the branch circuit.

Additional Proposed Changes

File Name	Description	Approved
Avail_Fault_Current_Calcs_PC_Submittal_r1.pdf	This file contains information that was developed for this public comment to provide available fault current data for services supplied by the specified transformers	
OBC_Substantiation_PC.docx	This is a word version of the public comment with the substantiation. It includes a listing of links for utility available fault currents.	

Statement of Problem and Substantiation for Public Comment

This Public Comment supports the use of AFCI protection. Protection from arcing-type faults have been needed for a long time. Arc faults aren't a new hazard, but they are one whose protection technology is relatively new and still evolving with ongoing changes to the electronics in the devices.

There are no changes proposed to 210.12(A)(3) or (4). The underlining was caused by Terra.

This PC provides another alternative for AFCI protection that does not exclude any other alternatives, such as those provided by a circuit breaker. The proposed option is an Outlet Branch Circuit (OBC) receptacle with the “home run” protected by a standard thermo-magnetic circuit breaker. Why is it not listed as an option presently? Part of the reason is, unfortunately, competition. Additionally, past concerns raised for protection of the “home run”, for the circuit lengths permitted in the NEC, was having sufficient available fault current at the service to reliably trip a standard thermo-magnetic circuit breaker in the instantaneous range.

It was stated that there would be no protection of the “home run” of NM-B cable from parallel arc faults since the OBC looks upstream only for series arc faults. The conditions included in the PC code text and the technical substantiation below resolves this concern.

The proposed new 210.12(A)(5) allows an OBC AFCI device that provides an equivalent level of safety to present AFCI requirements. Section 210.12(A)(5) requires satisfying six conditions to be applied as an option:

Conditions (a) through (c) are identical to the first three conditions of 210.12(A)(4).

There are 3 additional conditions that have been added to cover any outlier situations. These added conditions are based on conservative parameters, and ensure sufficient available fault current to reliably cause a thermo-magnet circuit breaker to trip for a parallel arc fault.

Condition (d) -- a minimum supply service transformer of 25 kVA was chosen to ensure there would be at least 3000A to magnetically trip the breaker. Representatives of utilities that are members of EEI have stated that 25 kVA is the smallest transformer typically installed for new residential developments.

Condition (e) -- the maximum service conductor length was determined mathematically by using the size of service conductors used by utilities, according to EEI: 1/0 and 3/0 aluminum. Each of the two lengths chosen (75’ and 125’, respectively) would ensure there would be at least 3000A at the service equipment with the smallest transformer of 25 kVA. Impedance is increased when a ferrous-metal conduit is used, hence the restriction for not allowing the use of ferrous metal conduit with this option.

Condition (f) ensures that the two-pole high magnetic trip level circuit breakers that are often used to protect HVAC units are excluded from use is in this new proposed option (5).

The 2 main points to justify this PC are as follows:

1. OBC PROVIDES EQUIVALENT PROTECTION TO A CIRCUIT BREAKER AFCI.

Section 210.12(A)(5) with all the conditions set ensures there is adequate available fault current to trip the branch circuit breaker to protect the home run from a parallel arc fault. A UL report confirmed 99% reliability of magnetic element tripping at 300 amps for a 15-amp breaker and 350 amps for a 20-amp breaker at the conductor lengths proposed in the PC. The calculations with an available fault current of 3000 amps or more demonstrate that the distances chosen will trip the branch circuit breaker greater than 99% of the time.

Simply, this PC shows that the parallel home run arc fault is better protected by the 99% effectiveness of the magnetic tripping that UL reported (at 300 amp [15-amp breaker] or 350 amps [20-amp breaker]), which is 10% better than the 89% effectiveness of AFCI tripping. Both are cited in UL’s report, “Effectiveness of Circuit Breakers in Mitigating Parallel Arcing Faults in the Home Run - Revised 11 January 2012” on page 55 and in Table 10. This OBC option presented in this PC is 10% more reliable.

2. OBC PROVIDES ANOTHER OPTION FOR INSTALLERS – ALLOWING OBC AFCI DEVICE

If incompatibilities arise with the AFCI circuit breaker, there needs to be another alternative when the AFCI circuit breaker is removed.

Details regarding both points, complete with references are below.

1. The OBC AFCI provides equivalent protection to a circuit breaker AFCI.

The issue raised in the past is whether there is sufficient fault current available to reliably protect the home run from parallel faults using a thermo-magnetic circuit breaker.

The premise for this part of the substantiation is based on the discussion of the latest updated section entitled, “Probability of Protection” and conclusion found in the UL report, “Effectiveness of Circuit Breakers in Mitigating Parallel Arcing Faults in the Home Run - Revised 11 January 2012” on page 55 and Table 10. This is an updated version of the Part II report previously issued. Among other revisions, this final report accounts for higher instantaneous trip currents for present day standard molded case circuit breakers and added the 20-amp breaker information to the final analysis. The following excerpt is from the conclusions in this report:

“The following observations are now made concerning an ability of a circuit breaker to mitigate a parallel arcing fault in lieu of a panel-mounted AFCI:
New 15 A circuit breakers show magnetic trip levels that are normally distributed around an average value of 213 A, and a standard deviation of 33 A. This suggests that 95% of all 15 A residential breakers will instantaneously trip at or above 278 A, and 99% of all breakers will magnetically trip at or above 299 A. New 20 A circuit breakers showed a mean value of 202 A, with 95% of all 20 A residential breakers instantaneously tripping at or above 314 A, and 99% of all breakers magnetically tripping at or above 349 A.”

The circuit breaker trip values of 300 and 350 amps were then taken and applied using the UL formula, provided in the cited report, to determine what would be the required available fault current at the service. This available fault current at the service is based on having the 300 amps for 14 AWG at 50 feet and 350 amps for 12 AWG at 70 feet.

Simply, this PC shows that the parallel home run arc fault is better protected by the 99% effectiveness of the magnetic tripping that UL reported (at 300 amp [15-amp breaker] or 350 amps [20-amp breaker]), which is 10% better than the 89% effectiveness of AFCI tripping. Both are cited in UL’s report, “Effectiveness of Circuit Breakers in Mitigating Parallel Arcing Faults in the Home Run - Revised 11 January 2012” on page 55 and Table 10. This OBC option presented in this PC is 10% more reliable.

The Outlet Branch Circuit (OBC) device provides series and parallel AFCI protection downstream of the device. In addition, the OBC device can detect an upstream series arc back to the service equipment panelboard; a circuit breaker does not do this, as the circuit breaker only looks downstream. The OBC can react when the circuit breaker cannot, to a panelboard fire. The OBC would react with a justifiable trip if there’s a problem upstream. Therefore, the open question when applying an OBC is protection from a parallel (hot to neutral or hot to equipment ground) arc fault upstream of the OBC - between the branch circuit thermo-magnetic circuit breaker and this first device.

THIS ISSUE HAS BEEN WELL RESEARCHED BY UL AND OTHERS, CONCLUDING THAT OBC AFCI PROVIDES RELIABLE AFCI PROTECTION WHEN USED IN COMBINATION WITH A PROPERLY RATED THERMO-MAGNETIC CIRCUIT BREAKER WITH LIMITED HOME RUN LENGTHS.

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Research indicates that a magnetic trip element that trips at 300 amps for 15 amp rated and 350 amps for 20 amp rated branch circuits is sufficient to provide parallel arc protection (Brazis et al., 2012) The available fault currents in new residential housing developments provide over 3000 amps of fault current which is more than the minimum needed to cause the thermo-magnetic breaker to trip with the wire lengths set in the proposed text.

What is the expected amount of fault current? In some areas of the country, sales of residential panelboards with a 22 kA rating are being required due to the increased available fault current as discovered in the Parks study for new construction. The higher available fault current increases the ability of the magnetic portion of a thermo-magnetic circuit breaker to detect and react to a parallel arcing fault with the conductor lengths, as proposed in this Public Comment. See Table 1: Utility information on available fault currents.

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AFCIs are relatively new and still evolving with changes to the electronics in the devices. However, trips due to incompatibilities continue to be a problem that is damaging the credibility of present-day AFCI protection. The primary culprits that appear to have incompatibilities are:

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In fact, when reported problematic tripping cannot be resolved, the Electrical Safety Authority in Ontario, Canada (the most populous Canadian province) has been granting permission for the replacement of AFCI breakers with thermo-magnetic breakers. This forgoes AFCI protection. Unless the AHJ requires it, there could be loss of the GFCI protection provided by the original circuit breaker. The loss of the AFCI protection may be an issue, as the hazards of arc faults still exist. The additional loss of GFCI protection is even more concerning because GFCI protection has a long history of reducing electrical shocks and the resulting injuries or electrocutions. The installation with the OBC AFCI device (as proposed in this PC) would provide a suitable alternative in this situation.

SUMMARY. This Public Comment supports the use of AFCI protection. The acceptance of the proposed text will result in increased safety through increased adoption due to having alternatives to circuit breaker AFCIs. As has been noted by Panel 2 members, there is more innovation in products developed by having alternatives, and acceptance of this PC adds another safe alternative.

REFERENCES
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Kerber, T. (2012). Short Circuit Fault Current Study, Parks Associates, Dallas, TX.

Related Item

- PI 4487

Submitter Information Verification

Submitter Full Name:	Mark Earley
Organization:	Alumni Code Consulting
Affiliation:	Arc Fault Circuit Interrupter Wiring Device Joint Research and Development Consortium
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Submittal Date:	Tue Aug 17 17:08:10 EDT 2021
Committee:	NEC-P02

PC to PI #4487

Insert a new 210.12(A)(5) as follows, and renumber subsequent subsections accordingly:

(A) Means of Protection. AFCI protection shall be provided by any of the following means:

…

(4) A listed outlet branch-circuit-type arc-fault circuit interrupter installed at the first outlet on the branch circuit in combination with a listed branch-circuit overcurrent protective device where all of the following conditions are met:

a. The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.

b. The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device to the first outlet shall not exceed 15.2 m (50 ft) for a 14 AWG conductor or 21.3 m (70 ft) for a 12 AWG conductor.

c. The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.

d. The combination of the branch-circuit overcurrent device and outlet branch-circuit AFCI shall be identified as meeting the requirements for a system combination-type AFCI and shall be listed as such.

(5) A listed outlet branch-circuit-type AFCI installed at the first outlet box on the branch circuit in combination with a listed branch-circuit overcurrent protective device where all of the following conditions are met:

a. The branch-circuit wiring shall be unspliced and untapped from the branch-circuit overcurrent device to the outlet branch-circuit AFCI.

b. The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device to the first outlet shall not exceed 15.2 m (50 ft) for a 14 AWG copper conductor or 21.3 m (70 ft) for a 12 AWG copper conductor.

c. The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.

d. The minimum transformer rating supplying the service shall be 25 kVA.

e. The maximum service conductor length from the transformer to the service equipment installed in other than ferro-magnetic conduit shall not exceed 38 m (125 ft) with minimum 3/0 aluminum conductor or 22.9 m (75 ft) with minimum 1/0 aluminum conductor

f. The branch circuit overcurrent protective device shall be a listed single pole thermo-magnetic breaker.

...

Substantiation:

This Public Comment supports the use of AFCI protection. Protection from arcing-type faults have been needed for a long time. Arc faults aren't a new hazard, but they are one whose protection technology is relatively new and still evolving with ongoing changes to the electronics in the devices.

There are no changes proposed to 210.12(A)(3) or (4). The underlining was caused by Terra.

This PC provides another alternative for AFCI protection that does not exclude any other alternatives such as those provided by a circuit breaker. The proposed option is an Outlet Branch Circuit (OBC) receptacle with the "home run" protected by a standard thermo-magnetic circuit breaker. Why is it not listed as an option presently? Part of the reason is unfortunately, competition. Additionally, past concerns raised for protection of the "home run", for the circuit lengths permitted in the NEC, was having sufficient available fault current at the service to reliably trip a standard thermo-magnetic circuit breaker in the instantaneous range.

It was stated that there would be no protection of the "home run" of NM-B cable from parallel arc faults since the OBC looks upstream only for series arc faults. The conditions included in the PC code text and the technical substantiation below resolves this concern.

The proposed new 210.12(A)(5) allows an OBC AFCI device that provides an equivalent level of safety to present AFCI requirements. Section 210.12(A)(5) requires satisfying six conditions to be applied as an option:

Conditions (a) through (c) are identical to the first three conditions of 210.12(A)(4).

There are 3 additional conditions that have been added to cover any outlier situations. These added conditions are based on conservative parameters, and ensure sufficient available fault current to reliably cause a thermo-magnet circuit breaker to trip for a parallel arc fault.

Condition (d) -- a minimum supply service transformer of 25 kVA was chosen to ensure there would be at least 3000A to magnetically trip the breaker. Representatives of utilities that are members of EEI have stated that 25 kVA is the smallest transformer typically installed for new residential developments.

Condition (e) -- the maximum service conductor length was determined mathematically by using the size of service conductors used by utilities, according to EEI: 1/0 and 3/0 aluminum. Each of the two lengths chosen (75' and 125', respectively) would ensure there would be at least 3000A at the service equipment with the smallest transformer of 25 kVA. Impedance is increased when a ferrous-metal conduit is used, hence the restriction for not allowing the use of ferrous metal conduit with this option.

Condition (f) ensures that the two-pole high magnetic trip level circuit breakers that are often used to protect HVAC units are excluded from use is in this new proposed option (5).

The 2 main points to justify this PC are as follows:

1. OBC PROVIDES EQUIVALENT PROTECTION TO A CIRCUIT BREAKER AFCI.
   Section 210.12(A)(5) with all the conditions set ensures there is adequate available fault current to trip the branch circuit breaker to protect the home run from a parallel arc fault. A UL report confirmed 99% reliability of magnetic element tripping at 300 amps for a 15-amp breaker and 350 amps for a 20-amp breaker at the conductor lengths proposed in the PC. The calculations with an available fault current of 3000 amps or more demonstrate that the distances chosen will trip the branch circuit breaker greater than 99% of the time.

   Simply, this PC shows that the parallel home run arc fault is better protected by the 99% effectiveness of the magnetic tripping that UL reported (at 300 amp [15-amp breaker] or 350 amps [20-amp breaker]), which is 10% better than the 89% effectiveness of AFCI tripping. Both are cited in UL's report, "Effectiveness of Circuit Breakers in Mitigating Parallel Arcing Faults in the Home Run - Revised 11 January 2012" on page 55 and in Table 10. This OBC option presented in this PC is 10% more reliable.

2. OBC PROVIDES ANOTHER OPTION FOR INSTALLERS – ALLOWING OBC AFCI DEVICE

If incompatibilities arise with the AFCI circuit breaker, there needs to be another alternative when the AFCI circuit breaker is removed.

Details regarding both points, complete with references are below.

1. **The OBC AFCI provides equivalent protection to a circuit breaker AFCI.**

The issue raised in the past is whether there is sufficient fault current available to reliably protect the home run from parallel faults using a thermo-magnetic circuit breaker.

The premise for this part of the substantiation is based on the discussion of the latest updated section entitled, "Probability of Protection" and conclusion found in the UL report, "*Effectiveness of Circuit Breakers in Mitigating Parallel Arcing Faults in the Home Run - Revised 11 January 2012*" on page 55 and Table 10. This is an updated version of the Part II report previously issued. Among other revisions, this final report accounts for higher instantaneous trip currents for present day standard molded case circuit breakers and added the 20-amp breaker information to the final analysis. The following excerpt is from the conclusions in this report:

> "The following observations are now made concerning an ability of a circuit breaker to mitigate a parallel arcing fault in lieu of a panel-mounted AFCI:
> New 15 A circuit breakers show magnetic trip levels that are normally distributed around an average value of 213 A, and a standard deviation of 33 A. This suggests that 95% of all 15 A residential breakers will instantaneously trip at or above 278 A, and 99% of all breakers will magnetically trip at or above 299 A. New 20 A circuit breakers showed a mean value of 202 A, with 95% of all 20 A residential breakers instantaneously tripping at or above 314 A, and 99% of all breakers magnetically tripping at or above 349 A."

The circuit breaker trip values of 300 and 350 amps were then taken and applied using the UL formula, provided in the cited report, to determine what would be the required available fault current at the service. This available fault current at the service is based on having the 300 amps for 14 AWG at 50 feet and 350 amps for 12 AWG at 70 feet.

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TABLE 1: Utility information on available fault currents

Utility Name	Website link where available fault current found
Alabama Power	https://www.alabamapower.com/content/dam/alabamapower/Business/Services%20by% Architects%20%26%20Engineers/A-E-Fault-Currents-Tables-FINAL-8-2003.pdf
Arizona Public Service	https://www.aps.com/-/media/APS/APSCOM-PDFs/About/Construction-and-Power-Line-S Services/Electric-Service-Requirements-Manual/800.ashx?la=en&hash=02E41D48D3C806F
Austin Energy	https://austinenergy.com/wcm/connect/ae/ae/contractors/electric-service-design-and-pla resources/transformer-fault-current-tables
Detroit Edison	https://newlook.dteenergy.com/wps/wcm/connect/dte-web/quicklinks/landing-pages-ten service
Duke Energy	http://www.swohioiaei.org/files/Utilities/Ohio_Metering_Installations_Red_Book_2019.pd
Minnesota Power	https://www.mnpower.com/Content/Documents/CustomerService/ConstructionCenter/sh
National Grid	https://www.nationalgridus.com/media/pronet/constr_esb750.pdf
NV Energy	https://www.nvenergy.com/publish/content/dam/nvenergy/brochures_arch/account-serv construction/electric-service-standards-south/re/ESRNPC-RE010-REV00.pdf
Omaha Public Power	https://www.oppd.com/media/250383/max-fault-currents-for-padmounted-transformers.
Snohomish County PUD	https://www.snopud.com/Site/Content/Documents/esr/DT_impedance-fault_418.pdf

Table Notes:

1) For Alabama Power the link has a line break put in as the overall link will not fit on the page.
2) For some of these sites you get a large service requirements manual then have to go to the right section or table for the information.
3) For Detroit Edison on the web site there are expansion links and the bottom one is for “Transformer Impedances” where the downloaded table was used.

Residential Service Fault Currents w/3/0 AWG

Transformer KVA - Single Phase 240/120 Volts	Transformer Impedance	Full Load Current @ 240 Volts Single Phase	Available Fault Current Phase to Phase	Available Fault Current Phase to Neutral	Available Fault Current Phase to Phase, 200 Amp Service, 3/0 Aluminum Service Conductor length (feet)				Available Fault Current Phase to Neutral, 200 Amp Service, 3/0 Aluminum Service Conductor length (feet)			
					25	50	100	200	25	50	100	200
25	1.00	104	10,420	15,630	8,415	7,056	5,335	3,586	9,114	6,433	4,050	2,326
	1.25		8,336	12,504	7,643	6,506	5,014	3,437	8,496	6,118	3,923	2,284
	1.5		6,947	10,421	5,995	5,272	4,247	3,059	7,097	5,336	3,586	2,165
	1.75		5,954	8,931	5,240	4,680	3,855	2,850	6,341	4,916	3,391	2,093
	2.00		5,210	7,815	4,656	4,208	3,528	2,668	5,757	4,557	3,217	2,025
	2.25		4,631	6,947	4,187	3,822	3,253	2,507	5,272	4,247	3,059	1,961
37.5	1.00	156	15,630	23,445	11,515	9,114	6,433	4,050	11,315	7,456	4,433	2,448
	1.25		12,504	18,756	9,724	7,955	5,833	3,804	10,096	6,906	4,233	2,386
	1.5		10,420	15,630	8,415	7,056	5,335	3,586	9,114	6,433	4,050	2,326
	1.75		8,931	13,397	7,416	6,341	4,916	3,391	8,307	6,019	3,882	2,269
	2.00		7,815	11,723	6,630	5,757	4,557	3,217	7,632	5,656	3,728	2,217
	2.25		6,947	10,421	5,995	5,272	4,247	3,059	7,057	5,336	3,586	2,165
50	1.00	208	20,830	31,245	14,108	10,667	7,170	4,331	12,864	8,099	4,652	2,512
	1.25		16,664	24,996	12.066	9,457	6,601	4,116	11,663	7,606	4,484	2,465
	1.5		13,887	20,831	10,540	8,492	6,117	3,922	10,668	7,170	4,331	2,416
	1.75		11,903	17,855	9,356	7,707	5,698	3,746	9,829	6,781	4,185	2,369
	2.00		10,415	15,623	8,411	7,054	5,334	3,585	9,111	6,432	4,049	2,326
	2.25		9,258	13,887	7.641	6,504	5,012	3,437	8,492	6,117	3,922	2,283
75	1.00	313	31,250	46,875	18,225	12,863	8,100	4,653	14,911	8,864	4,894	2,583
	1.25		25,000	37,500	15,908	11,663	7,605	4,485	13,811	8,464	4,770	2,546
	1.5		20,833	31,250	14,110	10,669	7,171	4,329	12,863	8,100	4,653	2,513
	1.75		17,857	26,786	12,678	9,828	6,780	4,186	12,038	7,763	4,540	2,480
	2.00		15,625	23,438	11,513	9,113	6,431	4,050	11,311	7,456	4,432	2,447
	2.25		13,889	20,834	10,542	8,493	6,117	3,922	10,669	7,169	4,329	2,417

Residential Service Fault Currents w/1/0 AWG

Transformer KVA - Single Phase 240/120 Volts	Transformer Impedance	Full Load Current @ 240 Volts Single Phase	Available Fault Current Phase to Phase	Available Fault Current Phase to Neutral	Available Fault Current Phase to Phase, 200 Amp Service, 1/0 Aluminum Service Conductor length (feet)				Available Fault Current Phase to Neutral, 200 Amp Service, 1/0 Aluminum Service Conductor length (feet)			
					25	50	100	200	25	50	100	200
25	1.00	104	10,420	15,630	7,596	5,976	4,189	2,622	7,388	4,837	2,862	1,576
	1.25		8,336	12,504	6,425	5,227	3,806	2,467	6,607	4,490	2,736	1,537
	1.5		6,947	10,421	5,567	4,644	3,488	2,329	5,976	4,189	2,622	1,500
	1.75		5,954	8,931	4,910	4,179	3,219	2,205	5,454	3,926	2,516	1,465
	2.00		5,210	7,815	4,393	3,798	2,988	2,094	5,016	3,694	2,419	1,431
	2.25		4,631	6,947	3,974	3,481	2,788	1,994	4,644	3,488	2,329	1,398
37.5	1.00	156	15,630	23,445	10,033	7,388	4,837	2,862	8,771	5,395	3,048	1,629
	1.25		12,504	18,756	8,647	6,607	4,490	2,736	8,020	5,100	2,952	1,602
	1.5		10,420	15,630	7,596	5,976	4,189	2,622	7,388	4,837	2,862	1,576
	1.75		8,931	13,397	6,772	5,454	3,926	2,516	6,849	4,601	2,777	1,549
	2.00		7,815	11,723	6,111	5,016	3,694	2,419	6,383	4,386	2,697	1,524
	2.25		6,947	10,421	5,567	4,644	3,488	2,329	5,976	4,189	2,622	1,500
50	1.00	208	20,830	31,245	11,948	8,376	5,243	3,000	9,673	5,724	3,149	1,659
	1.25		16,664	24,996	10450	7,612	4,933	2,895	8,979	5,472	3,072	1,637
	1.5		13,887	20,831	9,285	6,974	4,656	2,797	8,376	5,243	2,998	1,616
	1.75		11,903	17,855	8,355	6,436	4,410	2,707	7,851	5,032	2,928	1,594
	2.00		10,415	15,623	7,593	5,974	4,188	2,621	7,387	4,837	2,861	1,575
	2.25		9,258	13,887	6959	5,574	3,988	2,541	6,974	4,656	2,797	1,555
75	1.00	313	31,250	46,875	14,775	9,675	5,722	3,150	10,786	6,094	3,258	1,687
	1.25		25,000	37,500	13,213	8,980	5,473	3,073	10,200	5,903	3,203	1,673
	1.5		20,833	31,250	11,950	8,377	5,242	2,998	9,675	5,722	3,150	1,659
	1.75		17,857	26,786	10,907	7,852	5,032	2,929	9,198	5,553	3,096	1,645
	2.00		15,625	23,438	10,031	7,388	4,838	2,861	8,768	5,393	3,047	1,629
	2.25		13,889	20,834	9,286	6,975	4,657	2,797	8,377	5,242	2,998	1,615

US DOE Transformer Energy Efficiency Rule:
https://www1.eere.energy.gov/buildings/appliance_standards/pdfs/dt_final_rule.pdf

Available Fault Current Calculations
Eaton Bussmann Point to Point software FC2 -
http://faultcurrentcalculator.agilityspeaks.com/main-web.html?ver=1.5&noCache=1626454848749#phase-select

Steps

To calculate the full load current divide the KVA * 1000 by the line to line voltage of 240 volts

To calculate the short circuit current phase to phase and phase to neutral at the transformer complete steps 1 through 9 below

1) Launch FC2 Software (see link above)
2) Select system type as "single phase"
3) Add to system "Add Transformer to System"
4) Select "No, assume infinite current on primary"
5) Enter the KVA (25, 37.5, 50, 75)
6) Enter the secondary line to line voltage (240)
7) Enter the impedance (1.0, 1.25, 1.5, 1.75.2.0, 2.25)
8) Check 7 Tolerance as "0% - No Change"
9) Click "add to system" and review results

To calculate the short circuit current phase to phase and phase to neutral at the service with different service conductor lengths complete steps 10 through 19 below

10) Click "Add To My System" for adding conductor
11) Click "Add conductor run to system"
12) Enter the conductor length (25, 50, 100, 200)
13) Default is 1 conductor per phase, do not change
14) Enter conductor size from drop down list (3/0 or 1/0)
15) Check the conductor material (Aluminum)
16) Check the conductor type (3 single conductors)
17) Check conduit type (nonmagnetic)
18) Click "Add to System"
19) Scroll down and review results of available fault current phase to phase and phase to neutral

To change just the conductor length, click on "delete" in the conductor box and repeat steps 10 to 19

To change the transformer and conductor click "delete" in both the conductor and transformer boxes and repeat steps 1 through 19.

Public Comment No. 1435-NFPA 70-2021 [Section No. 210.12(B)]

(B) Dwelling Units.

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) ~~Kitchens~~

(2)

(3) Family rooms

(4) Dining rooms

(5) Living rooms

(6) Parlors

(7) Libraries

(8) Dens

(9) Bedrooms

(10) Sunrooms

(11) Recreation rooms

(12) Closets

(13) Hallways

(14) ~~Laundry areas~~

(15)

(16) Similar areas

Exception No. 1: AFCI protection shall not be required for an individual branch circuit supplying a fire alarm system installed in accordance with 760.41(B) or 760.121(B). The branch circuit shall be installed in a metal raceway, metal auxiliary gutter, steel-armored cable, or Type MC or Type AC cable meeting the applicable requirements of 250.118, with metal boxes, conduit bodies, and enclosures.

Exception No. 2: AFCI protection shall be required for the individual branch circuit supplying a receptacle for arc welding equipment in a dwelling unit effective January 1, 2025.

Informational Note No. 1: See UL 1699-2011, *Standard for Arc-Fault Circuit-Interrupters*, for information on combination-type and branch/feeder-type AFCI devices. See UL Subject 1699A, *Outline of Investigation for Outlet Branch Circuit Arc-Fault Circuit-Interrupters*, for information on outlet branch-circuit type AFCI devices. See UL Subject 1699C, *Outline of Investigation for System Combination Arc-Fault Circuit Interrupters*, for information on system combination AFCIs.

Informational Note No. 2: See 29.9.4(5) of *NFPA 72*-2019, *National Fire Alarm and Signaling Code*, for information on secondary power source requirements for smoke alarms installed in dwelling units.

Informational Note No. 3: See 760.41(B) and 760.121(B) for power source requirements for fire alarm systems.

Additional Proposed Changes

File Name	Description	Approved
Residential_Building_Electrical_Malfunction_Fire_Trend_2010-2019.pdf	Residential Building Electrical Malfunction Fire Trend 2010-2019: this file is a self-developed and original graph depicting the most recent 10-year malfunction trend using information from the U.S. Fire Administration made available in the public domain via www.usfa.fema.gov. This public domain link is: https://www.usfa.fema.gov/data/statistics/residential-fire-estimates/residential-building-electrical-malfunction-fire-trends.html	
State_by_State_AFCI_Amendments_August_2021.pdf	Overview of AFCI Requirements: states and major municipalities that have made amendments to reduce AFCI requirements as of August 2021	
PC_1435_confirming_only_areas_to_be_changed_with_related_substantiation.pdf	File depicting the only areas to be changed (changes to 210.12(B)), along with the related substantiation	

Statement of Problem and Substantiation for Public Comment

This PC proposes deletion of kitchens and laundry areas from the requirements of 210.12(B) because: a) these locations were added to the NEC in 2014 without justification, and b) are where many unwanted trips occur, often due to small motor-driven appliances used in these areas.

There are 2 major reasons why kitchens and laundry areas should not be required to have AFCIs:

1. NO DATA TO JUSTIFY EXPANSION.

2. EXPANSION WITHOUT CONSIDERATION OF INCOMPATIBILITIES CAUSING UNWANTED TRIPS; AFCIs NEED FURTHER REFINEMENT. EXPANSION IS OUT OF THE QUESTION UNTIL SUCH TIME WHEN THE INCOMPATABILITY IS SOLVED – REDUCE LOCATIONS WITH THIS PC.

a. 22 states have taken exception to AFCI requirements when adopting the NEC with amendments to solve unwanted (or “nuisance”) tripping problems.

b. Electrical Safety Authority (ESA) governing Ontario, Canada has a policy to allow removal of problematic AFCIs where unwanted tripping is occurring; they’re allowed to be exchanged with ordinary breakers. As long as you report it to ESA, there appears to be no deadline to replace the AFCI.

c. There’s a Class Action Lawsuit filed in April 2021 asserting that AFCI circuit breakers frequently and unnecessarily trip in the presence of common and harmless arcs, resulting in economic harms to consumers and electrical companies.

d. A major utility company in the South (Dominion Energy SC) has openly raised concerns with the problem of nuisance tripping in service territories covering newer neighborhoods with homes built before the 2020 NEC was adopted.

e. First Revision 9628 passed to add a 2025 effective date for AFCI protection for arc welding machines because of unwanted trips. If we held this standard for all the appliances with unwanted trips, there would be an entire list of appliances exempt from AFCI protection.

f. Unwanted trips could cause inadvertent removal of GFCI protection. In an East Carolina University survey, 83% of respondents (residential electricians who install AFCIs) indicated they had or knew of someone who had replaced AFCI breakers with standard circuit breakers. This of course could result in the inadvertent loss of GFCI protection on the circuit if the breaker is a dual function device.

g. ASHE issued a notice that it does not advocate for the use of a combination of TRR, GFCI and AFCI. They advocate for (non-combo) tamper-resistance and GFCIs, but not AFCIs. The notice can be found at: https://www.ashe.org/tamper-resistant-receptacle-use-patient-settings

h. Deferment of GFCI requirements for HVAC equipment (mandate before incompatibilities explored, such as impacted HVAC equipment without sophisticated motor control circuitry).

Details on both reasons #1 and #2 (with items a through h) complete with references are found below.

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1. NO DATA TO JUSTIFY EXPANSION. DUE TO UNWANTED TRIPPING PROBLEMS, THERE SHOULD BE REDUCTIONS.

The Panel Resolution statement from the First Draft read as follows: “Removal of kitchens and laundry areas and addition of new Exception No. 1 in Section 210.12 has not been substantiated and would be a reduction in safety.” However, there is no proof that having AFCIs in kitchens and laundry areas actually has made or does make those areas safer.

There is no practical method to collect relevant data, according to the Fire Protection Research Foundation. Its 2018 report, "Residential Electrical Fire Problem: The Data Landscape," FIRE PROTECTION RESEARCH FOUNDATION (V. Hutchison, Oct. 2018) ["2018 Foundation Report"], available at: https://www.nfpa.org//-/media/Files/News-and-Research/Fire-statistics-and-reports/Electrical/RFResidentialElectricalFireData.pdf made the following candid observations about the lack of reliable data:

"[T]here is limited data available on AFCI's impact on residential electrical fires. This is largely due to the fact that fire statistics do not measure the effectiveness of prevention devices. … [T]here is uncertainty regarding the residential electrical fire problem and the effectiveness of branch circuit protection devices, such as AFCI's." (Page 4)

"Currently, the existing residential electrical data is generally unrefined and provides limited value to the analysis of determining the effectiveness of electrical branch circuit protection devices." (Page 29)

"The most significant problem with residential electrical fire data is that nearly all of the currently available public data is lacking in quality and accuracy, and is relatively unusable for data analytics in its current state." (Page 30)

A Data Summit held in November 2019 confirmed that the data problem continues. See "Electrical Data Summit: Impact of Data in the Electrical World," FIRE PROTECTION RESEARCH FOUNDATION, (April 2020) at page 51 of 66 (noting the "lack of quality data available for assessment" because the data was in "disparate data sources, largely incomplete, or nonexistent"), available at: https://www.nfpa.org//-/media/Files/News-and-Research/Fire-statistics-and-reports/Proceedings/RFElectricalDataSummitWorkshop.pdf

There is simply no known reliable data indicating or showing that the expansion of AFCI requirements in the NEC has resulted in a quantifiable reduction of residential fires due to electrical malfunctions. In fact, the trends show either an increase in electrical fires or no change in fire reductions.

The 2018 Foundation Report observed that "home fires involving electrical wiring and related equipment have generally been on the rise since 2002[.]" (2018 Foundation Report, pg. 3 of 33).

Per the U.S. Fire Administration, a 10-year trend from 2010 to 2019 shows no significant decrease or increase in residential electrical fires (see attached “Residential Building Electrical Malfunction Fire Trend 2010-2019”).

There is simply no evidence that shows expanding AFCI into kitchens and laundry areas is proven to increase safety in those areas.

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2. EXPANSION WITHOUT CONSIDERATION OF INCOMPATIBILITIES CAUSING UNWANTED TRIPS; AFCIs NEED FURTHER REFINEMENT. EXPANSION OUT OF THE QUESTION – REDUCE LOCATIONS WITH THIS PC.

a. 22 States have taken Exception to AFCI Requirements: States are continuing to amend AFCI requirements. Many states and local jurisdictions have amended the code at the local level to require AFCI protection only in bedrooms, which is where AFCIs were originally proposed to reduce fires. Others have eliminated provisions to expand use in kitchens and laundry areas to reduce complaints due to unwanted tripping. No fewer than twenty-two states have amendments modifying AFCI requirements. This creates work for state governing bodies, and it defeats the whole purpose of a national code. CMP-2 voters have referenced state amendments as part of their reason for rejecting AFCI expansion (both last cycle and this time around). NECA’s voting representative included this as part of his initial balloting comments with each of his First Revision negative votes: "If this expansion passes it will also cause States to continue to not adopt sections of the NEC. Currently there are 22 States that amend or reduce the requirements of AFCI, and this new area may add to the number of states not adopting AFCI." See attached “State by State AFCI Amendments August 2021”, with details for each state.

b. Electrical Safety Authority (ESA) governing Ontario, Canada has a policy to allow removal of problematic AFCIs where unwanted tripping is occurring; they’re allowed to be exchanged with ordinary breakers. As long as you report it to ESA, there appears to be no deadline to replace the AFCI. According to ESA staff, there have been over 200 units approved for the deviation process. The deviation process has not been publicized by ESA, so it is anticipated that after it is published, the requests will soar.

c. AFCI Class Action Lawsuit: The unwanted trip problem with AFCIs is real, and a major issue for contractors. There is an AFCI Class Action lawsuit asserting that AFCI circuit breakers frequently and unnecessarily trip in the presence of common and harmless arcs resulting in economic harms to consumers and electrical companies. The Class Action Complaint, available at http://casefilingsalert.com /wp-content/uploads/2021/05/Siemens-Circuit-Breakers.pdf, claims that "the breaker may be tripping due to harmless arcs or that the cause of the nuisance tripping is a defect in the breaker itself." (Class Action Complaint, ¶ 73.)

d. A major utility company in the South (Dominion Energy SC) has openly raised concerns with the problem of nuisance tripping in service territories covering newer neighborhoods with homes built before the 2020 NEC was adopted. An August 2, 2021 e-mail from a Dominion Energy SC employee read as follows:

“I got your contact info from an article regarding the new GFCI requirements for HVAC units. I am a power quality engineer with Dominion Energy. There is a large new neighborhood in our service territory that seems to have GFCI breakers that trip on power restoration at times. These homes were built before the 2020 code was adopted, so they don’t have the HVAC issue but I wondered if you had any good contacts with Eaton who might could answer some technical questions on unpublished reasons that Combination AFCI/GFCIs would trip with the ground fault code displayed. They don’t have a problem with nuisance tripping at other times. Also, have you run into this? Any information you could share would be appreciated.”

Since no technical information is known as to why the breaker indicates the GFCI trip, it is possible that the noise/leakage is flowing to ground and the GFCI reacts faster than the AFCI detection circuitry which has longer limits (8 arcing half-cycles).

e. First Revision 9628 passed to add a 2025 effective date for AFCI protection for arc welding machines because of unwanted trips. If we held this standard for all appliances associated with unwanted trips, there would be an entire list of appliances exempt from AFCI protection. The Panel Statement read: “This exception would provide a window of opportunity to continue the research currently underway between AFCI manufacturers and manufacturers of welding equipment. With the expansion of AFCIs, this equipment may need more time to address the possibility of unwanted tripping. CMP 2 is affording the manufacturers of these solutions time to address any compatibility concerns should any be identified.” What about all the other appliance manufacturers? Other appliances known to be associated with unwanted trips include microwaves, bathroom fans, appliances that incorporate variable speed motors and switching power supplies, other non-linear power conversion equipment, and soft start equipment.

f. Inadvertent Removal of GFCI Protection: AFCI unwanted trips can lead to removal of lifesaving GFCI protection when the original breaker is a dual function device. AFCI requirements should not have been expanded into areas where moisture is present. As a result, many contractors are installing dual function circuit breakers that provide both AFCI and GFCI protection. New kitchen and laundry appliances are rapidly being introduced that are causing unwanted AFCI tripping. Contractors are called back to correct the problem, resulting in very significant frustration, and added costs. When faced with unwanted tripping of dual function AFCI/GFCI circuit breakers, many homeowners opt to take matters into their own hands and replace the dual function AFCI/GFCI circuit breaker with a less expensive standard circuit breaker. This can result in these areas being left without any lifesaving GFCI protection. This removal and other issues with AFCIs were noted by WY Chief Electrical Inspector Jane Allred. Additionally, contractors are also replacing AFCI breakers with standard circuit breakers because of unwanted tripping. A recent study conducted by East Carolina University noted that 83% of respondents (residential electricians who install AFCIs) indicated they had or knew of someone who had replaced AFCI breakers with standard circuit breakers. This of course could result in the inadvertent loss of GFCI protection on the circuit.

g. American Society of Health Care Engineering (ASHE) put out a notice informing its members and the health care field that it does not advocate for the use of a combination of TRR, GFCI and AFCI, as this combination will significantly increase the risk of disruption to patient care through nuisance tripping, which will take staff attention away from the patients. They advocate for (non-combo) tamper-resistance and GFCIs but not AFCIs. The notice can be found at: https://www.ashe.org/tamper-resistant-receptacle-use-patient-settings

h. Expansion without consideration of incompatibilities causing unwanted trips has led to deferment of GFCI requirements for HVAC Equipment. GFCI protection was expanded in 210.8(F) of the 2020 NEC to require all outdoor outlets rated 150 volts to ground or less and 50 amperes or less to be provided with GFCI protection. As such, outdoor HVAC equipment is now required to be GFCI protected. However, widespread unwanted tripping is causing significant issues in the field. It is believed unwanted tripping is due to incomplete evaluation of compatibility between HVAC units and GFCI protection devices. These requirements were placed into the NEC without consideration of potential compatibility problems. Several members of CMP-2 sit on committees and have finally begun to consider unwanted tripping issues as states have begun to adopt the 2020 NEC, but with no real solution is sight.

This new development is a consequence of deflecting responsibility for unwanted tripping arising out of installation code requirements becoming mandated before interoperability with equipment necessarily attached to and located "downstream" of protection technology is assured. There has been significant pushback in the form of emergency measures for installation exemptions to 210.8(F) at the state level. Multiple TIAs under consideration seek to defer GFCI protection requirements on outdoor outlets (primarily citing impacted HVAC equipment) until January 1, 2023 because of unwanted trips.

The reason GFCI protection needed to be added is because at least one electrocution occurred due to a ground fault on HVAC equipment. Therefore, approval of these TIAs represents acceptance of limited risk while technical problems are resolved. Similarly, the “electroindustry” as represented by NEMA took a significant departure from a long-standing position of not compromising on "increasing safety" to support this GFCI exemption by pushing for this installation mandate as quickly as possible ahead of assuring interoperability. Most circuit breaker providers wave the AFCI safety banner with no compromise where the NEC solely has their product embodiment ensconced and unencumbered for new residential construction. However, when there is pressure from external stakeholders downstream due to unwanted tripping from inattention to interoperability, and when it suits their purpose, ONLY THEN will circuit breaker providers accept a compromise on the deployment of safety (proven GFCI life-safety in this case). The amount of work NEMA invested into developing the great volume of comments supporting TIA 1593 is indicative of their rationalization needed to justify backing away from 210.8(F).

This logic can be extended to the expansion of AFCI protection in a similar fashion. Unwanted tripping of AFCIs is causing significant issues in the field because AFCI requirements were expanded into areas where there is equipment that can cause unwanted tripping. This includes areas with motor loads and power conversion equipment, such as kitchen and laundry areas. Like GFCI unwanted tripping, unwanted tripping due to AFCIs is a result of a technology that requires further refinement.

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SUMMARY:

Ironically, the Panel Resolution statement from the First Draft read as follows: “Removal of kitchens and laundry areas and addition of new Exception No. 1 in Section 210.12 has not been substantiated and would be a reduction in safety.” However, there is no proof that having AFCIs in kitchens and laundry areas makes those areas safer. This is proven by statements from NFPA’s Fire Protection Research Foundation and charts from the USFA.

There is no practical method to collect the relevant data, according to the Fire Protection Research Foundation. Their report concludes: “Fire statistics do not measure the effectiveness of prevention devices in residential dwellings.” There is no known data indicating that the expansion of AFCI requirements in the NEC has resulted in a quantifiable reduction of residential fires due to electrical malfunctions. Thus, the claim by the circuit breaker community that "there have been no documented cases of an electrical fire on an AFCI-protected circuit" is an empty assertion and unprovable.

Mandates must wait to ensure incompatibilities will not cause more problems than the “solution”. Accentuating these points are recent TIAs to deal with incompatibilities, a class action lawsuit, effective dates for certain problematic equipment, and US states, Ontario’s ESA and ASHE not enforcing the AFCI requirements. The actions around the outdoor GFCI situation demonstrate lack of impartiality about finding fault with AFCI unwanted tripping, as well as failure to insist on interoperability as a prerequisite in standards implementation (i.e. - if interoperability had been emphasized, unwanted nuisance tripping would be less frequent).

	Related Item
• Just as PI 2588 proposed for 210.12(A) in the 2020 NEC, PC 1435 proposes deletion of kitchens and laundry areas from 210.12(B) because these locations were added to the 2014 NEC despite no proven reduction in fires to confirm the efficacy of AFCIs. In addition since then, kitchens and laundry rooms have been where many nuisance trips occur, often due to small motor-driven appliances prevalent in these areas.	

Submitter Information Verification

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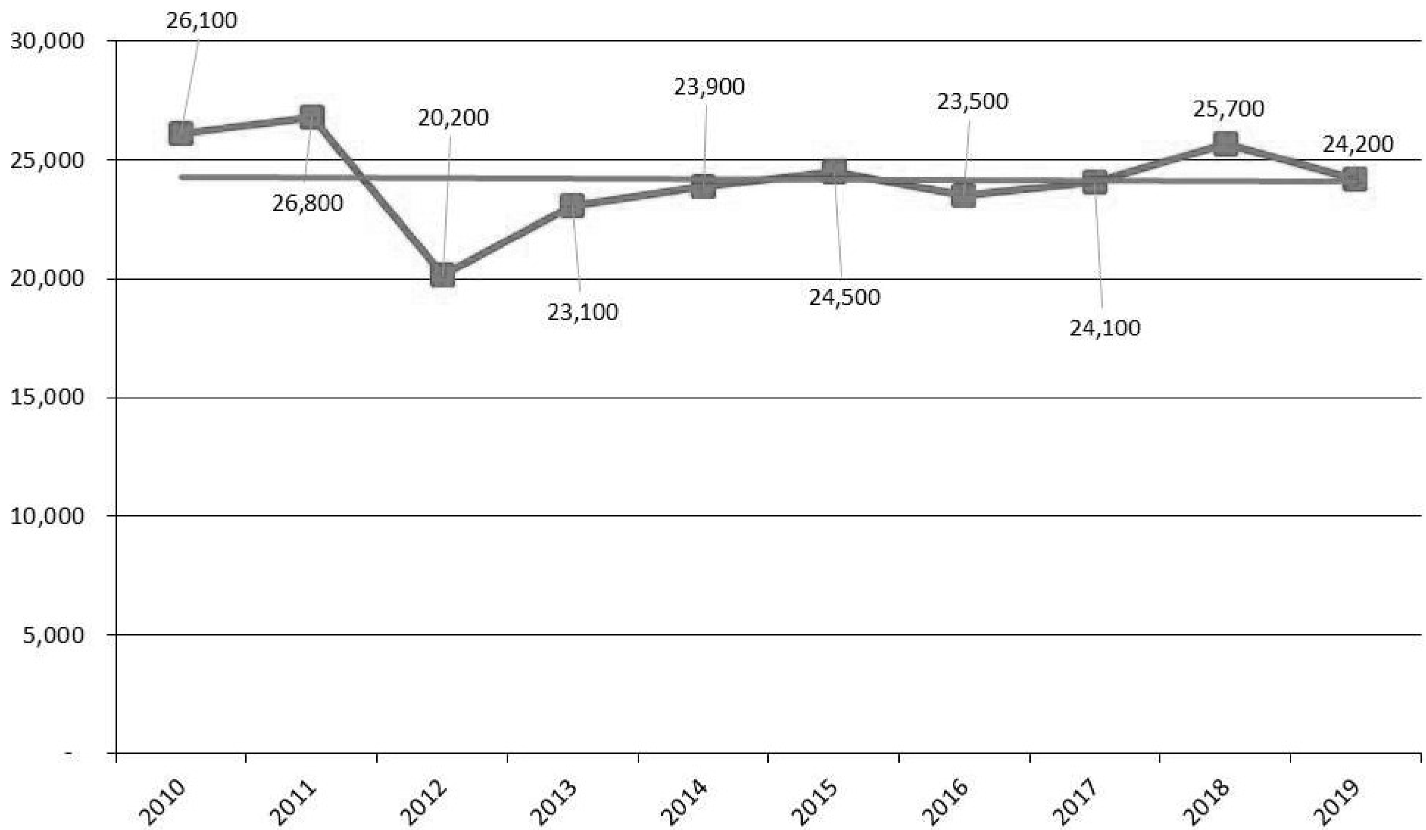
Submittal Date:	Fri Aug 13 11:59:14 EDT 2021
Committee:	NEC-P02

Residential Building Electrical Malfunction Fire Trend: FEMA USFA

2010 - 2019



10-year trend = 0.8% decrease in fires

Source: FEMA USFA Fire Estimate Summary: Residential Building Fire Trend; Malfunction Fire Trend (2010-2019) – report dated April 2021

Revised – August 2021

STATE-BY-STATE NEC ADOPTION

Overview of AFCI Requirements: 22 states and 3 major municipalities have made amendments to reduce the AFCI requirements. Below is a summary of the changes that have been made:

Montana (2017 NEC*) – Removed requirements to install AFCIs in kitchens.

South Dakota (2020 NEC) – Includes an exception which would not require AFCIs on life support and similar equipment.

North Dakota (2020 NEC) – AFCI protection not required for refrigeration appliances if a single receptacle on a dedicated circuit is installed.

Iowa (2020 NEC) – AFCI requirements for branch circuit extensions or modifications in dwelling or dormitory units were deleted.

Wisconsin (2017 NEC) – AFCI requirements do not apply to kitchens.

Michigan (2018 IRC) – AFCI requirements were deleted.

Indiana (2018 IRC) – AFCI requirements were deleted for modifications or renovations of homes. New construction will require AFCIs

Ohio (2017 NEC) – AFCI requirements were deleted for receptacles installed to serve kitchen countertops.

Vermont (2017 NEC) – AFCI requirements for branch circuit extensions or modifications were deleted where the extension of the existing conductors is used solely to hardwire single station smoke and or CO alarms in an existing dwelling or dormitory unit.

New Hampshire (2017 NEC) – AFCI requirements for dormitory unit devices and bathrooms, guest rooms and guest suites, and branch circuit extensions or modifications for dormitory units were deleted.

Idaho (2017 NEC) – AFCI protection is only required in bedrooms.

Oregon (2020 NEC) – AFCI requirements deleted from branch circuits that supply hallways, kitchen or laundry areas, as well as GFCI protected receptacles installed in dining rooms. AFCI protection shall not be required for optional, dedicated outlets that supply equipment known to cause unwanted tripping of AFCI devices and for branch circuits that serve an appliance that is not easily moved or that is fastened in place.

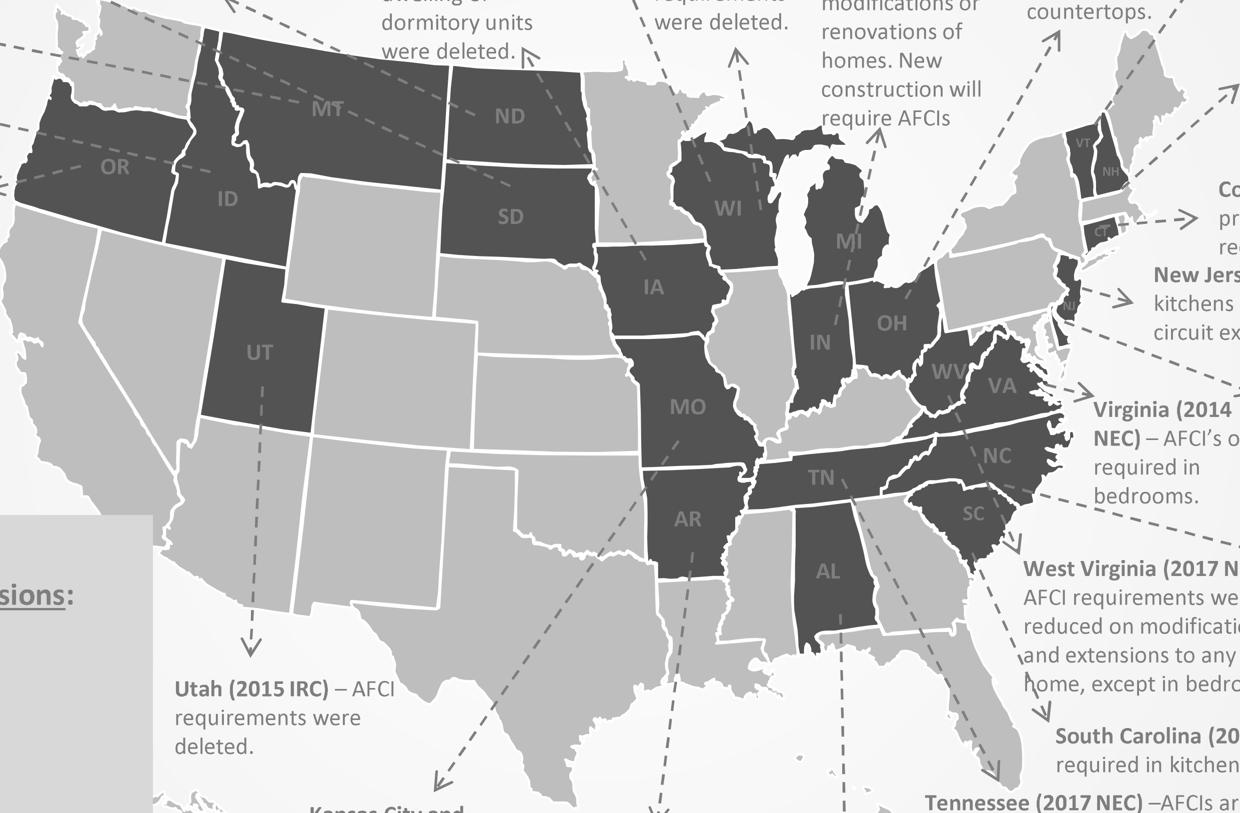
Connecticut (2015 IRC; 2017 NEC) – AFCI protection not required for replacement receptacles.

New Jersey (2017 NEC) - AFCI requirements for kitchens and laundry areas, as well as for branch circuit extensions or modifications, were deleted.

Delaware (2014 NEC) – Smoke alarms shall not be placed on branch circuits protected by AFCI's.

Virginia (2014 NEC) – AFCI's only required in bedrooms.

North Carolina (2017 NEC) – AFCI requirements for kitchens and laundry areas were deleted, as well as those for dormitory unit bathrooms guest room and guest suites, and extensions or modifications.



West Virginia (2017 NEC) – AFCI requirements were reduced on modifications and extensions to any new home, except in bedrooms

South Carolina (2018 IRC) - AFCI's will not be required in kitchens and laundry areas.

Utah (2015 IRC) – AFCI requirements were deleted.

Kansas City and Springfield, MO (2011 NEC) – AFCI's only required in bedrooms.

Arkansas (2017 NEC) – AFCI's are not required in kitchens and laundry areas.

Tennessee (2017 NEC) –AFCIs are optional for bathrooms, laundry areas, garages, unfinished basements, work or similar area, and for branch circuits dedicated to supplying refrigeration equipment.

Mobile, AL (2014 NEC) – AFCI's requirements were deleted for family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets and hallways

Overview of NEC adopted versions:

- **2020 NEC – 8 States**
- **2017 NEC – 25 States**
- **2014 NEC – 3 States**
- **2011 NEC – 1 State**
- **2008 NEC – 1 State**
- **Local Adoption – 5 States:** *Alabama, Arizona, Mississippi, Missouri and Nevada.*
- **AFCI Requirements Controlled by International Residential Code – 7 States**

* Pending final approval

Public Comment #1435

Revision to Existing Section 210.8(B):

(B) Dwelling Units.

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) Kitchens~~
(2) Family rooms
(3) Dining rooms
(4) Living rooms
(5) Parlors
(6) Libraries
(7) Dens
(8) Bedrooms
(9) Sunrooms
(10) Recreation rooms
(11) Closets
(12) Hallways
(13) ~~Laundry areas~~
(14) Similar areas

Exception No. 1: AFCI protection shall not be required for an individual branch circuit supplying a fire alarm system installed in accordance with 760.41(B) or 760.121(B). The branch circuit shall be installed in a metal raceway, metal auxiliary gutter, steel-armored cable, or Type MC or Type AC cable meeting the applicable requirements of 250.118, with metal boxes, conduit bodies, and enclosures.

Exception No. 2: AFCI protection shall be required for the individual branch circuit supplying a receptacle for arc welding equipment in a dwelling unit effective January 1, 2025.

Informational Note No. 1: See UL 1699-2011, *Standard for Arc-Fault Circuit-Interrupters*, for information on combination-type and branch/feeder-type AFCI devices. See UL Subject 1699A, *Outline of Investigation for Outlet Branch Circuit Arc-Fault Circuit-Interrupters*, for information on outlet branch-circuit type AFCI devices. See UL Subject 1699C, *Outline of Investigation for System Combination Arc-Fault Circuit Interrupters*, for information on system combination AFCIs.

Informational Note No. 2: See 29.9.4(5) of *NFPA 72*-2019, *National Fire Alarm and Signaling Code*, for information on secondary power source requirements for smoke alarms installed in dwelling units.

Informational Note No. 3: See 760.41(B) and 760.121(B) for power source requirements for fire alarm systems.

Substantiation:

This PC proposes deletion of kitchens and laundry areas from the requirements of 210.12(B) because: a) these locations were added to the NEC in 2014 without justification, and b) are where many unwanted trips occur, often due to small motor-driven appliances used in these areas.

There are 2 major reasons why kitchens and laundry areas should not be required to have AFCIs:

1. NO DATA TO JUSTIFY EXPANSION.
2. EXPANSION WITHOUT CONSIDERATION OF INCOMPATIBILITIES CAUSING UNWANTED TRIPS; AFCIs NEED FURTHER REFINEMENT. EXPANSION IS OUT OF THE QUESTION UNTIL SUCH TIME WHEN THE INCOMPATABILITY IS SOLVED – REDUCE LOCATIONS WITH THIS PC.

a. 22 states have taken exception to AFCI requirements when adopting the NEC with amendments to solve unwanted (or “nuisance”) tripping problems.

b. Electrical Safety Authority (ESA) governing Ontario, Canada has a policy to allow removal of problematic AFCIs where unwanted tripping is occurring; they’re allowed to be exchanged with ordinary breakers. As long as you report it to ESA, there appears to be no deadline to replace the AFCI.

c. There’s a Class Action Lawsuit filed in April 2021 asserting that AFCI circuit breakers frequently and unnecessarily trip in the presence of common and harmless arcs, resulting in economic harms to consumers and electrical companies.

d. A major utility company in the South (Dominion Energy SC) has openly raised concerns with the problem of nuisance tripping in service territories covering newer neighborhoods with homes built before the 2020 NEC was adopted.

e. First Revision 9628 passed to add a 2025 effective date for AFCI protection for arc welding machines because of unwanted trips. If we held this standard for all the appliances with unwanted trips, there would be an entire list of appliances exempt from AFCI protection.

f. Unwanted trips could cause inadvertent removal of GFCI protection. In an East Carolina University survey, 83% of respondents (residential electricians who install AFCIs) indicated they had or knew of someone who had replaced AFCI breakers with standard circuit breakers. This of course could result in the inadvertent loss of GFCI protection on the circuit if the breaker is a dual function device.

g. ASHE issued a notice that it does not advocate for the use of a combination of TRR, GFCI and AFCI. They advocate for (non-combo) tamper-resistance and GFCIs, but not AFCIs. The notice can be found at: https://www.ashe.org/tamper-resistant-receptacle-use-patient-settings

h. Deferment of GFCI requirements for HVAC equipment (mandate before incompatibilities explored, such as impacted HVAC equipment without sophisticated motor control circuitry).

Details on both reasons #1 and #2 (with items a through h) complete with references are found below.

****

1. NO DATA TO JUSTIFY EXPANSION. DUE TO UNWANTED TRIPPING PROBLEMS, THERE SHOULD BE REDUCTIONS.

The Panel Resolution statement from the First Draft read as follows: “Removal of kitchens and laundry areas and addition of new Exception No. 1 in Section 210.12 has not been substantiated and would be a reduction in safety.” However, there is no proof that having AFCIs in kitchens and laundry areas actually has made or does make those areas safer.

There is no practical method to collect relevant data, according to the Fire Protection Research Foundation. Its 2018 report, "*Residential Electrical Fire Problem: The Data Landscape*," FIRE PROTECTION RESEARCH FOUNDATION (V. Hutchison, Oct. 2018) ["2018 Foundation Report"], available at: https://www.nfpa.org//-/media/Files/News-and-Research/Fire-statistics-and-reports/Electrical/RFResidentialElectricalFireData.pdf made the following candid observations about the lack of reliable data:

"[T]here is limited data available on AFCI's impact on residential electrical fires. This is largely due to the fact that fire statistics do not measure the effectiveness of prevention devices. … [T]here is uncertainty regarding the residential electrical fire problem and the effectiveness of branch circuit protection devices, such as AFCI's." (Page 4)

"Currently, the existing residential electrical data is generally unrefined and provides limited value to the analysis of determining the effectiveness of electrical branch circuit protection devices." (Page 29)

"The most significant problem with residential electrical fire data is that nearly all of the currently available public data is lacking in quality and accuracy, and is relatively unusable for data analytics in its current state." (Page 30)

A Data Summit held in November 2019 confirmed that the data problem continues. See "Electrical Data Summit: Impact of Data in the Electrical World," FIRE PROTECTION RESEARCH FOUNDATION, (April 2020) at page 51 of 66 (noting the "lack of quality data available for assessment" because the data was in "disparate data sources, largely incomplete, or nonexistent"), available at: https://www.nfpa.org//-/media/Files/News-and-Research/Fire-statistics-and-reports/Proceedings/RFElectricalDataSummitWorkshop.pdf

There is simply no known reliable data indicating or showing that the expansion of AFCI requirements in the NEC has resulted in a quantifiable reduction of residential fires due to electrical malfunctions. In fact, the trends show either an increase in electrical fires or no change in fire reductions.

The 2018 Foundation Report observed that "home fires involving electrical wiring and related equipment have generally been on the rise since 2002[.]" (2018 Foundation Report, pg. 3 of 33).

Per the U.S. Fire Administration, a 10-trend from 2010 to 2019 shows no significant decrease or increase in residential electrical fires (see attached “Residential Building Electrical Malfunction Fire Trend 2010-2019”).

There is simply no evidence that shows expanding AFCI into kitchens and laundry areas is proven to increase safety in those areas.

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2. EXPANSION WITHOUT CONSIDERATION OF INCOMPATIBILITIES CAUSING UNWANTED TRIPS; AFCIs NEED FURTHER REFINEMENT. EXPANSION OUT OF THE QUESTION – REDUCE LOCATIONS WITH THIS PC.

    a. 22 States have taken Exception to AFCI Requirements: States are continuing to amend AFCI requirements. Many states and local jurisdictions have amended the code at the local level to require AFCI protection only in bedrooms, which is where AFCIs were originally proposed to reduce fires. Others have eliminated provisions to expand use in kitchens and laundry areas to reduce complaints due to unwanted tripping. No fewer than twenty-two states have amendments modifying AFCI requirements. This creates work for state governing bodies, and it defeats the whole purpose of a national code. CMP-2 voters have referenced state amendments as part of their reason for rejecting AFCI expansion (both last cycle and this time around). NECA’s voting representative included this as part of his initial balloting comments with each of his First Revision negative votes: "If this expansion passes it will also cause States to continue to not adopt sections of the NEC. Currently there are 22 States that amend or reduce the requirements of AFCI, and this new area may add to the number of states not adopting AFCI." See attached “State by State AFCI Amendments August 2021”, with details for each state.

b. Electrical Safety Authority (ESA) governing Ontario, Canada has a policy to allow removal of problematic AFCIs where unwanted tripping is occurring; they're allowed to be exchanged with ordinary breakers. As long as you report it to ESA, there appears to be no deadline to replace the AFCI. According to ESA staff, there have been over 200 units approved for the deviation process. The deviation process has not been publicized by ESA, so it is anticipated that after it is published, the requests will soar.

c. AFCI Class Action Lawsuit: The unwanted trip problem with AFCIs is real, and a major issue for contractors. There is an AFCI Class Action lawsuit asserting that AFCI circuit breakers frequently and unnecessarily trip in the presence of common and harmless arcs resulting in economic harms to consumers and electrical companies. The Class Action Complaint, available at http://casefilingsalert.com/wp-content/uploads/2021/05/Siemens-Circuit-Breakers.pdf, claims that "the breaker may be tripping due to harmless arcs or that the cause of the nuisance tripping is a defect in the breaker itself." (Class Action Complaint, ¶ 73.)

d. A major utility company in the South (Dominion Energy SC) has openly raised concerns with the problem of nuisance tripping in service territories covering newer neighborhoods with homes built before the 2020 NEC was adopted. An August 2, 2021 e-mail from a Dominion Energy SC employee read as follows:

   "I got your contact info from an article regarding the new GFCI requirements for HVAC units. I am a power quality engineer with Dominion Energy. There is a large new neighborhood in our service territory that seems to have GFCI breakers that trip on power restoration at times. These homes were built before the 2020 code was adopted, so they don't have the HVAC issue but I wondered if you had any good contacts with Eaton who might could answer some technical questions on unpublished reasons that Combination AFCI/GFCIs would trip with the ground fault code displayed. They don't have a problem with nuisance tripping at other times. Also, have you run into this? Any information you could share would be appreciated."

   Since no technical information is known as to why the breaker indicates the GFCI trip, it is possible that the noise/leakage is flowing to ground and the GFCI reacts faster than the AFCI detection circuitry which has longer limits (8 arcing half-cycles).

e. First Revision 9628 passed to add a 2025 effective date for AFCI protection for arc welding machines because of unwanted trips. If we held this standard for all appliances associated with unwanted trips, there would be an entire list of appliances exempt from AFCI protection. The Panel Statement read: "This exception would provide a window of opportunity to continue the research currently underway between AFCI manufacturers and manufacturers of welding equipment. With the expansion of AFCIs, this equipment may need more time to address the possibility of unwanted tripping. CMP 2 is affording the manufacturers of these solutions time to address any compatibility concerns should any be identified." What about all the other appliance manufacturers? Other appliances known to be associated with unwanted trips include microwaves, bathroom fans, appliances that incorporate variable speed motors and switching power supplies, other non-linear power conversion equipment, and soft start equipment.

f. Inadvertent Removal of GFCI Protection: AFCI unwanted trips can lead to removal of lifesaving GFCI protection when the original breaker is a dual function device. AFCI requirements should not have been expanded into areas where moisture is present. As a result, many contractors are installing dual function circuit breakers that provide both AFCI and GFCI protection. New kitchen and laundry appliances are rapidly being introduced that are causing unwanted AFCI tripping. Contractors are called back to correct the problem, resulting in very significant frustration, and added costs. When faced with unwanted tripping of dual function AFCI/GFCI circuit breakers, many homeowners opt to take matters into their own hands and replace the dual function AFCI/GFCI circuit breaker with a less expensive standard circuit breaker. This can result in these areas being left without any lifesaving GFCI protection. This removal and other issues with AFCIs were noted by WY Chief Electrical Inspector Jane Allred. Additionally, contractors are also replacing AFCI breakers with standard circuit breakers because of unwanted tripping. A recent study conducted by East Carolina University noted that 83% of respondents (residential electricians who install AFCIs) indicated they had or knew of someone who had replaced AFCI breakers with standard circuit breakers. This of course could result in the inadvertent loss of GFCI protection on the circuit.

g. American Society of Health Care Engineering (ASHE) put out a notice informing its members and the health care field that it does not advocate for the use of a combination of TRR, GFCI and AFCI, as this combination will significantly increase the risk of disruption to patient care through nuisance tripping, which will take staff attention away from the patients. They advocate for (non-combo) tamper-resistance and GFCIs but not AFCIs. The notice can be found at: https://www.ashe.org/tamper-resistant-receptacle-use-patient-settings

h. Expansion without consideration of incompatibilities causing unwanted trips has led to deferment of GFCI requirements for HVAC Equipment. GFCI protection was expanded in 210.8(F) of the 2020 NEC to require all outdoor outlets rated 150 volts to ground or less and 50 amperes or less to be provided with GFCI protection. As such, outdoor HVAC equipment is now required to be GFCI protected. However, widespread unwanted tripping is causing significant issues in the field. It is believed unwanted tripping is due to incomplete evaluation of compatibility between HVAC units and GFCI protection devices. These requirements were placed into the NEC without consideration of potential compatibility problems. Several members of CMP-2 sit on committees and have finally begun to consider unwanted tripping issues as states have begun to adopt the 2020 NEC, but with no real solution is sight.

   This new development is a consequence of deflecting responsibility for unwanted tripping arising out of installation code requirements becoming mandated before interoperability with equipment necessarily attached to and located "downstream" of protection technology is assured. There has been significant pushback in the form of emergency measures for installation exemptions to 210.8(F) at the state level. Multiple TIAs under consideration seek to defer GFCI protection requirements on outdoor outlets (primarily citing impacted HVAC equipment) until January 1, 2023 because of unwanted trips.

   The reason GFCI protection needed to be added is because at least one electrocution occurred due to a ground fault on HVAC equipment. Therefore, approval of these TIAs represents acceptance of limited risk while technical problems are resolved. Similarly, the “electroindustry” as represented by NEMA took a significant departure from a long-standing position of not compromising on "increasing safety" to support this GFCI exemption by pushing for this installation mandate as quickly as possible ahead of assuring interoperability. Most circuit breaker providers wave the AFCI safety banner with no compromise where the NEC solely has their product embodiment ensconced and unencumbered for new residential construction. However, when there is pressure from external stakeholders downstream due to unwanted tripping from inattention to interoperability, and when it suits their purpose, ONLY THEN will circuit breaker providers accept a compromise on the deployment of safety (proven GFCI life-safety in this case). The amount of work NEMA invested into developing the great volume of comments supporting TIA 1593 is indicative of their rationalization needed to justify backing away from 210.8(F).

This logic can be extended to the expansion of AFCI protection in a similar fashion. Unwanted tripping of AFCIs is causing significant issues in the field because AFCI requirements were expanded into areas where there is equipment that can cause unwanted tripping. This includes areas with motor loads and power conversion equipment, such as kitchen and laundry areas. Like GFCI unwanted tripping, unwanted tripping due to AFCIs is a result of a technology that requires further refinement.

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SUMMARY:

Ironically, the Panel Resolution statement from the First Draft read as follows: “Removal of kitchens and laundry areas and addition of new Exception No. 1 in Section 210.12 has not been substantiated and would be a reduction in safety.” However, there is no proof that having AFCIs in kitchens and laundry areas makes those areas safer. This is proven by statements from NFPA’s Fire Protection Research Foundation and charts from the USFA.

There is no practical method to collect the relevant data, according to the Fire Protection Research Foundation. Their report concludes: “Fire statistics do not measure the effectiveness of prevention devices in residential dwellings.” There is no known data indicating that the expansion of AFCI requirements in the NEC has resulted in a quantifiable reduction of residential fires due to electrical malfunctions. Thus, the claim by the circuit breaker community that "there have been no documented cases of an electrical fire on an AFCI-protected circuit" is an empty assertion and unprovable.

Mandates must wait to ensure incompatibilities will not cause more problems than the “solution”. Accentuating these points are recent TIAs to deal with incompatibilities, a class action lawsuit, effective dates for certain problematic equipment, and US states, Ontario’s ESA and ASHE not enforcing the AFCI requirements. The actions around the outdoor GFCI situation demonstrate lack of impartiality about finding fault with AFCI unwanted tripping, as well as failure to insist on interoperability as a prerequisite in standards implementation (i.e. - if interoperability had been emphasized, unwanted nuisance tripping would be less frequent).

Public Comment No. 1451-NFPA 70-2021 [Section No. 210.12(B)]

(B) Dwelling Units.

~~All~~ In other than newly constructed buildings, 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) Kitchens

(2) Family rooms

(3) Dining rooms

(4) Living rooms

(5) Parlors

(6) Libraries

(7) Dens

(8) Bedrooms

(9) Sunrooms

(10) Recreation rooms

(11) Closets

(12) Hallways

(13) Laundry areas

(14) Similar areas

Exception No. 1: AFCI protection shall not be required for an individual branch circuit supplying a fire alarm system installed in accordance with 760.41(B) or 760.121(B). The branch circuit shall be installed in a metal raceway, metal auxiliary gutter, steel-armored cable, or Type MC or Type AC cable meeting the applicable requirements of 250.118, with metal boxes, conduit bodies, and enclosures.

Exception No. 2: AFCI protection shall be required for the individual branch circuit supplying a receptacle for arc welding equipment in a dwelling unit effective January 1, 2025.

Informational Note No. 1: See UL 1699-2011, *Standard for Arc-Fault Circuit-Interrupters*, for information on combination-type and branch/feeder-type AFCI devices. See UL Subject 1699A, *Outline of Investigation for Outlet Branch Circuit Arc-Fault Circuit-Interrupters*, for information on outlet branch-circuit type AFCI devices. See UL Subject 1699C, *Outline of Investigation for System Combination Arc-Fault Circuit Interrupters*, for information on system combination AFCIs.

Informational Note No. 2: See 29.9.4(5) of *NFPA 72*-2019, *National Fire Alarm and Signaling Code*, for information on secondary power source requirements for smoke alarms installed in dwelling units.

Informational Note No. 3: See 760.41(B) and 760.121(B) for power source requirements for fire alarm systems.

Statement of Problem and Substantiation for Public Comment

The fire data the code-making panel reviewed before introducing requirements for AFCIs into the 1999 NEC did not include the age of the dwellings. This information would have been helpful to determine the scope of the fire hazard AFCIs were meant to address relative to the age of the housing stock. The requirements could have been applied in a targeted manner to those homes at greatest risk of electrical arcing.

When the date of construction is provided for the dwellings where actual fire incidents occur, it shows that the average age of homes linked to electrical fires is over seventy (70) years.

The added text is similar to language found in NFPA 101, section 11.8.2.2.

Related Item

• FR No. 9093

Submitter Information Verification

Submitter Full Name: Daniel Buuck
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Submittal Date: Fri Aug 13 14:21:32 EDT 2021
Committee: NEC-P02

Public Comment No. 1761-NFPA 70-2021 [Section No. 210.12(B)]

(B) Dwelling Units.

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) Kitchens

(2) Family rooms

(3) Dining rooms

(4) Living rooms

(5) Parlors

(6) Libraries

(7) Dens

(8) Bedrooms

(9) Sunrooms

(10) Recreation rooms

(11) Closets

(12) Hallways

(13) Laundry areas

(14) <u>Attics</u>

(15) Similar areas

Exception No. 1: AFCI protection shall not be required for an individual branch circuit supplying a fire alarm system installed in accordance with 760.41(B) or 760.121(B). The branch circuit shall be installed in a metal raceway, metal auxiliary gutter, steel-armored cable, or Type MC or Type AC cable meeting the applicable requirements of 250.118, with metal boxes, conduit bodies, and enclosures.

Exception No. 2: AFCI protection shall be required for the individual branch circuit supplying a receptacle for arc welding equipment in a dwelling unit effective January 1, 2025.

Informational Note No. 1: See UL 1699-2011, *Standard for Arc-Fault Circuit-Interrupters*, for information on combination-type and branch/feeder-type AFCI devices. See UL Subject 1699A, *Outline of Investigation for Outlet Branch Circuit Arc-Fault Circuit-Interrupters*, for information on outlet branch-circuit type AFCI devices. See UL Subject 1699C, *Outline of Investigation for System Combination Arc-Fault Circuit Interrupters*, for information on system combination AFCIs.

Informational Note No. 2: See 29.9.4(5) of *NFPA 72*-2019, *National Fire Alarm and Signaling Code*, for information on secondary power source requirements for smoke alarms installed in dwelling units.

Informational Note No. 3: See 760.41(B) and 760.121(B) for power source requirements for fire alarm systems.

Additional Proposed Changes

File Name	Description	Approved
MS_State_Fire_Marshal_Press_Rel_02_10_2020.pdf		

Statement of Problem and Substantiation for Public Comment

The comments provided during the balloting process stated that there was no substantiation for the addition of AFCI protection for attics. The PI substantiation detailed this very information, but here are additional details.

AFCI's protect electrical circuits from fire as detailed within the UL 1699 product safety standard. Electrical malfunctions cause attic fires at an annual average of 4520/yr. and 40 deaths per NFPA 2019 Home Electrical Fires Table 8. Electrical malfunctions within attics would primarily be attic fans or utility receptacle outlets. Therefore, a high percentage of electrical malfunctions with these limited circuits should be protected by AFCI's. This information does provide the data on the need for improved fire prevention protection and AFCI's will provide that protection. Here is a specific example of fatalities from electrical malfunctions in the attic. A house fire that killed seven people in Mississippi in February of 2020 was deemed accidental and it was caused by an electrical issue in the attic, per the state fire marshal.

Other Examples:
https://www.atticprojectsseattle.com/top-3-causes-of-attic-fires/
https://www.usfa.fema.gov/downloads/pdf/statistics/v11i6.pdf
https://www.atticguys.com/leading-attic-fires/

The Commonwealth of Massachusetts requires AFCI protection on all circuits since their adoption of the 2020 NEC w/ this amendment on January 1, 2020. There have been no documented calls related to any unwanted tripping incidences for attics.

Related Item

• FR 9015-NFPA 70-2021

Submitter Information Verification

Submitter Full Name:	Randy Dollar
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Submittal Date:	Tue Aug 17 16:53:49 EDT 2021
Committee:	NEC-P02

FOR IMMEDIATE RELEASE
February 10, 2020

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STATE FIRE MARSHAL MIKE CHANEY ISSUES STATEMENT ON CLINTON HOUSE FIRE

JACKSON, Miss. – The State Fire Marshal's Office (SFMO) is investigating a house fire on Old Vicksburg Road in Clinton that killed seven people in the early hours of Saturday, February 8, 2020.

SFMO investigators have determined the fire was accidental and electrical in nature. It appears the fire started in the attic of the home. It also appears there were no working smoke alarms in the home. Without smoke alarms, there was no early detection and it may have prevented the victims from getting out in time. SFMO investigators believe metal bars on the windows of the home played a small role in the deaths.

"This is a tragic situation. The family of the victims have my sincere condolences," said State Fire Marshal and Insurance Commissioner Mike Chaney.

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Public Comment No. 1765-NFPA 70-2021 [Section No. 210.12(B)]

(B) Dwelling Units.

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) Kitchens

(2) Family rooms

(3) Dining rooms

(4) Living rooms

(5) Parlors

(6) Libraries

(7) Dens

(8) Bedrooms

(9) Sunrooms

(10) Recreation rooms

(11) Closets

(12) Hallways

(13) Laundry areas

(14) <u>Bathrooms</u>

(15) Similar areas

Exception No. 1: AFCI protection shall not be required for an individual branch circuit supplying a fire alarm system installed in accordance with 760.41(B) or 760.121(B). The branch circuit shall be installed in a metal raceway, metal auxiliary gutter, steel-armored cable, or Type MC or Type AC cable meeting the applicable requirements of 250.118, with metal boxes, conduit bodies, and enclosures.

Exception No. 2: AFCI protection shall be required for the individual branch circuit supplying a receptacle for arc welding equipment in a dwelling unit effective January 1, 2025.

Informational Note No. 1: See UL 1699-2011, *Standard for Arc-Fault Circuit-Interrupters*, for information on combination-type and branch/feeder-type AFCI devices. See UL Subject 1699A, *Outline of Investigation for Outlet Branch Circuit Arc-Fault Circuit-Interrupters*, for information on outlet branch-circuit type AFCI devices. See UL Subject 1699C, *Outline of Investigation for System Combination Arc-Fault Circuit Interrupters*, for information on system combination AFCIs.

Informational Note No. 2: See 29.9.4(5) of *NFPA 72*-2019, *National Fire Alarm and Signaling Code*, for information on secondary power source requirements for smoke alarms installed in dwelling units.

Informational Note No. 3: See 760.41(B) and 760.121(B) for power source requirements for fire alarm systems.

Additional Proposed Changes

File Name	Description	Approved
Compatibility_AFCI_Validation.jpg		
Bathroom_fans_tested_at_cycling_humidity_and_temp.jpg		

Statement of Problem and Substantiation for Public Comment

The comments provided during the balloting process stated that there was no substantiation for the addition of AFCI protection for Bathrooms and concerns about unwanted tripping of appliances that may be fed from these circuits. The PI substantiation detailed this very information, but here are additional details.

AFCI's protect electrical circuits from fire as detailed within the UL 1699 product safety standard. Electrical malfunctions cause bathroom fires at an annual average of 2120/yr. and 10 deaths per NFPA 2019 Home Electrical Fires Table 8. Electrical malfunctions within bathrooms would primarily be bathroom fans or appliances utilizing receptacle outlets. Therefore, a high percentage of electrical malfunctions with these limited circuits would be protected by AFCI's. The home run from the load center to the bathroom is at risk of damage as well as the wiring in the bathroom itself. This information does provide the data on the need for improved fire prevention and AFCI's will provide that protection. The addition of bathrooms into 210.12 (A) will correlate with the existing requirement in 210.12 (B).

There has been significant AFCI testing done on bathroom cord/plug appliances as well as bathroom fans including humidity level testing to prevent unwanted tripping. A large percentage of manufacturers products are tested to confirm the lack of unwanted tripping. Examples provided in attachments.

The Commonwealth of Massachusetts requires AFCI protection on all circuits since their adoption of the 2020 NEC w/ this amendment on January 1, 2020. There have been no documented calls related to any unwanted tripping incidences for bathrooms.

Related Item

- FR 9081-NFPA 70-2021

Submitter Information Verification

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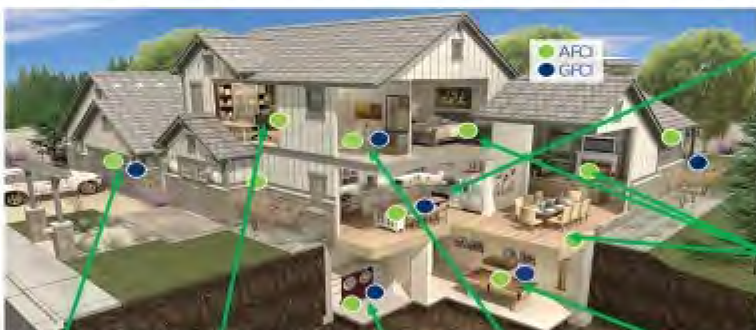
Zip:	
Submittal Date:	Tue Aug 17 16:59:58 EDT 2021
Committee:	NEC-P02

Compatibility AFCI Validation – Home appliance lab emulation

The lab is equipped with +2000 home electrical loads / +24000 combination test cases



Kitchen Appliances Brands:
Refrigerators: 7 Brands
Coffee makers
Dishwashers
Microwaves
Garbage Disposal
Toasters
Cooking/heating
Furnace Blowers
Freezers
Small appliances (Blenders, Can openers, food processors)
Ice Makers

Living rooms areas:
Fan
Window A/C
TV (LED, OLED, Plasma, LCD)
Projection equipment

Garage loads:
Miter saw
Lawn equipment
Snow Blower
Circular saws
Sawzall
Impact tools
Dremel High speed
Garage Door openers
Air Compressors
Arc Welding Equipment

Home A/V, Computer:
- Routers: 7 Brands
- Printers (Laser, Inkjet)
- Game stations
- PC/Laptops
- UPS
- Accessories (Monitors)

Laundry Loads
Washers: 7 Brands
Gas Dryer
Electric Dryer
Iron steamer

Bathrooms:
Fan
Hair curler
Hair Straightener
Jet tubs

Basement loads:
Sump pumps
Lighting
Health & Fitness (Treadmill)

Outdoor loads:
Pools
Hot Tubs
HVAC

All areas loads:
Robotic vacuums
Portable vacuums

Bathroom fans tested at cycling humidity and temp

No nuisance tripping registered

[redacted]

The test included fan samples with and without Humidity sensors.

Test setup is was done using 1P AFCI CB and 1P DF (AFCI/GFCI) CB.

Humidity was cycled 90/40 RH

Public Comment No. 1768-NFPA 70-2021 [Section No. 210.12(B)]

(B) Dwelling Units.

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) Kitchens

(2) Family rooms

(3) Dining rooms

(4) Living rooms

(5) Parlors

(6) Libraries

(7) Dens

(8) Bedrooms

(9) Sunrooms

(10) Recreation rooms

(11) Closets

(12) Hallways

(13) Laundry areas

(14) <u>Garages</u>

(15) Similar areas

<u>*The requirement for Garages shall become effective January 1, 2026.*</u>

Exception No. 1: AFCI protection shall not be required for an individual branch circuit supplying a fire alarm system installed in accordance with 760.41(B) or 760.121(B). The branch circuit shall be installed in a metal raceway, metal auxiliary gutter, steel-armored cable, or Type MC or Type AC cable meeting the applicable requirements of 250.118, with metal boxes, conduit bodies, and enclosures.

Exception No. 2: AFCI protection shall be required for the individual branch circuit supplying a receptacle for arc welding equipment in a dwelling unit effective January 1, 2025.

Informational Note No. 1: See UL 1699-2011, *Standard for Arc-Fault Circuit-Interrupters*, for information on combination-type and branch/feeder-type AFCI devices. See UL Subject 1699A, *Outline of Investigation for Outlet Branch Circuit Arc-Fault Circuit-Interrupters*, for information on outlet branch-circuit type AFCI devices. See UL Subject 1699C, *Outline of Investigation for System Combination Arc-Fault Circuit Interrupters*, for information on system combination AFCIs.

Informational Note No. 2: See 29.9.4(5) of *NFPA 72*-2019, *National Fire Alarm and Signaling Code*, for information on secondary power source requirements for smoke alarms installed in dwelling units.

Informational Note No. 3: See 760.41(B) and 760.121(B) for power source requirements for fire alarm systems.

Statement of Problem and Substantiation for Public Comment

The comments provided during the balloting process stated that there was no substantiation for the addition of AFCI protection for garages. The PI substantiation detailed this very information, but here are additional details.

AFCI's protect electrical circuits from fire as detailed within the UL 1699 product safety standard. Per the U.S. Fire Administration, each year there are over 6600 garage fires resulting in an average of 30 deaths, 400 injuries, and $457M in property loss. Electrical malfunction is a major contributor to the number with an annual average of 1590/yr. and 10 deaths per NFPA 2019 Home Electrical Fires Table 8. Therefore, a high percentage of electrical malfunctions with these circuits should be protected by AFCI's. The prevention of any of these fires has a major impact on life and property. This information does provide the data on the need for improved fire prevention and AFCI's will provide that protection.
There have been over 100,00 unwanted tripping tests performed on a variety of garage loads. Here are a few of them. There have also been field trials that included these loads. Several of these loads have had AFCI protection on their receptacle outlets since 2016 as contractors were utilizing dual function breakers for all circuits. One example would be a Lincoln Pro-Mig 135 welder installed in Leicaster, NC.

Garage Loads:
Miter saw
Lawn equipment
Snow Blower
Circular saws
Sawzall
Impact tools
Dremel High speed
Garage Door openers
Air Compressors

Arc Welders

The Commonwealth of Massachusetts requires AFCI protection on all circuits since their adoption of the 2020 NEC w/ this amendment on January 1, 2020. There have been no documented calls related to any unwanted tripping incidences for garages.

Related Item

- FR 9003-NFPA 70-2021

Submitter Information Verification

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Street Address:	
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State:	
Zip:	
Submittal Date:	Tue Aug 17 17:09:27 EDT 2021
Committee:	NEC-P02

Public Comment No. 1865-NFPA 70-2021 [Section No. 210.12(B)]

(B) Dwelling Units.

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) Kitchens

(2) Family rooms

(3) Dining rooms

(4) Living rooms

(5) Parlors

(6) Libraries

(7) Dens

(8) Bedrooms

(9) Sunrooms

(10) Recreation rooms

(11) Closets

(12) Hallways

(13) Laundry areas

(14) Similar areas

Exception No. 1: AFCI protection shall not be required for an individual branch circuit supplying a fire alarm system installed in accordance with 760.41(B) or 760.121(B). The branch circuit shall be installed in a metal raceway, metal auxiliary gutter, steel-armored cable, or Type MC or Type AC cable meeting the applicable requirements of 250.118, with metal boxes, conduit bodies, and enclosures.

~~*Exception No. 2: AFCI protection shall be required for the individual branch circuit supplying a receptacle for arc welding equipment in a dwelling unit effective January 1, 2025.*~~

Informational Note No. 1: See UL 1699-2011, *Standard for Arc-Fault Circuit-Interrupters*, for information on combination-type and branch/feeder-type AFCI devices. See UL Subject 1699A, *Outline of Investigation for Outlet Branch Circuit Arc-Fault Circuit-Interrupters*, for information on outlet branch-circuit type AFCI devices. See UL Subject 1699C, *Outline of Investigation for System Combination Arc-Fault Circuit Interrupters*, for information on system combination AFCIs.

Informational Note No. 2: See 29.9.4(5) of *NFPA 72*-2019, *National Fire Alarm and Signaling Code*, for information on secondary power source requirements for smoke alarms installed in dwelling units.

Informational Note No. 3: See 760.41(B) and 760.121(B) for power source requirements for fire alarm systems.

Statement of Problem and Substantiation for Public Comment

First revisions 9092 and 9003 that would have required AFCI protection in garages failed ballot. AFCI protection is determined by location and not equipment to be protected therefore this revision is not necessary as welders are typically located in garages. Also, this would create inspection problems for the AHJ. What would prevent a homeowner from unplugging from a AFCI protected outlet in the garage (for the welder) and plugging into a garage receptacle that is not AFCI protected?

Related Item

• FR 9628

Submitter Information Verification

Submitter Full Name: Agnieszka Golriz
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City:
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Zip:
Submittal Date: Wed Aug 18 12:00:55 EDT 2021
Committee: NEC-P02

Public Comment No. 2204-NFPA 70-2021 [Section No. 210.12(B)]

(B) Dwelling Units.

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) Kitchens

(2) Family rooms

(3) Dining rooms

(4) Living rooms

(5) Parlors

(6) Libraries

(7) Dens

(8) Bedrooms

(9) Sunrooms

(10) Recreation rooms

(11) Closets

(12) Hallways

(13) Laundry areas

(14) Similar areas

Exception No. 1: AFCI protection shall not be required for an individual branch circuit supplying a fire alarm system installed in accordance with 760.41(B) or 760.121(B). The branch circuit shall be installed in a metal raceway, metal auxiliary gutter, steel-armored cable, or Type MC or Type AC cable meeting the applicable requirements of 250.118, with metal boxes, conduit bodies, and enclosures.

Exception No. 2: AFCI protection shall be required for the individual branch circuit supplying a receptacle for arc welding equipment in a dwelling unit effective January 1, 2025.

Informational Note No. 1: See UL 1699-2011, *Standard for Arc-Fault Circuit-Interrupters*, for information on combination-type and branch/feeder-type AFCI devices. See UL Subject 1699A, *Outline of Investigation for Outlet Branch Circuit Arc-Fault Circuit-Interrupters*, for information on outlet branch-circuit type AFCI devices. See UL Subject 1699C, *Outline of Investigation for System Combination Arc-Fault Circuit Interrupters*, for information on system combination AFCIs.

Informational Note No. 2: See 29.9.4(5) of *NFPA 72*-2019, *National Fire Alarm and Signaling Code*, for information on secondary power source requirements for smoke alarms installed in dwelling units.

Informational Note No. 3: See 760.41(B) and 760.121(B) for power source requirements for fire alarm systems.

AHAM is submitting public comments on NEC 2023.

On behalf of the Association of Home Appliance Manufacturers (AHAM), I would like to provide our comments on 2023 NEC. AHAM continues to be concerned about NFPA's specifying product level requirements that are beyond the listing requirements yet is not doing anything to assure that the misalignment is addressed.

AHAM represents manufacturers of major, portable and floor care home appliances, and suppliers to the industry. AHAM's membership includes over 150 companies throughout the world. AHAM members employ tens of thousands of people and produce more than 95% of the household appliances shipped for sale. The appliance industry directly employs over 377,000 workers in the U.S. and AHAM members produce more than 95% of the household appliances shipped for sale domestically. The industry's total economic impact exceeds $198 billion. The home appliance industry, through its products and innovation, is essential to consumer lifestyle, health, safety and convenience. Through its technology, employees and productivity, the industry contributes significantly to jobs and economic security. Home appliances also are a success story in terms of energy efficiency and environmental impact as new appliances often represent the most effective choice a consumer can make to reduce home energy use and costs.

AHAM supports NFPA and the efforts to have a US National Electric Code. AHAM is a member of CMP-17 and has applied for membership of CMP-2. AHAM is concerned that NFPA continues to establish requirements for AFCIs and GFCIs when there are known nuisance tripping issues between the devices and other products.

- LeGrande submitted a request in PI 2588 to remove AFCI's from kitchens and laundry rooms. They highlight that a number of states and local jurisdictions have amended the code at the local level to require AFCI protection only in bedrooms, which is where AFCIs were originally proposed to reduce fires. Other jurisdictions have eliminated provisions to expand use in kitchens and laundry rooms to reduce complaints due to nuisance tripping. No fewer than twenty-one states have amendments modifying AFCI requirements. This creates work for state governing bodies and it defeats the whole purpose of a national code. Based on the continued nuisance complaints between appliances and these breakers and the lack of progress to any updates to UL1699 (AFCI) to address the nuisance tripping, AHAM supports the efforts to limit code applications of these devices until compatibility issues can be addressed.

Statement of Problem and Substantiation for Public Comment

AFCI/Appliance incompatibility

Related Item

- Public Input No. 2588-

Submitter Information Verification

Submitter Full Name:	Matt Williams
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Submittal Date:	Thu Aug 19 16:37:48 EDT 2021
Committee:	NEC-P02

Public Comment No. 889-NFPA 70-2021 [Section No. 210.12(B)]

(B) Dwelling Units.

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) Kitchens

(2) Family rooms

(3) Dining rooms

(4) Living rooms

(5) Parlors

(6) Libraries

(7) Dens

(8) Bedrooms

(9) Sunrooms

(10) Recreation rooms

(11) Closets

(12) Hallways

(13) Laundry areas

(14) Similar areas

Exception No. 1: AFCI protection shall not be required for an individual branch circuit supplying a fire alarm system installed in accordance with 760.41(B) or 760.121(B). The branch circuit shall be installed in a metal raceway, metal auxiliary gutter, steel-armored cable, or Type MC or Type AC cable meeting the applicable requirements of 250.118, with metal boxes, conduit bodies, and enclosures.

Exception No. 2: AFCI protection shall be required for the individual branch circuit supplying a receptacle for arc welding equipment in a dwelling unit effective January 1, 2025.

<u>Exception No. 3. AFCI protection shall not be required for the individual branch circuit connected to outlets or receptacle outlets serving equipment including: microwaves, bathroom fans, appliances that incorporate variable speed motors and switching power supplies, other non-linear power conversion equipment, soft-start equipment and other portable equipment likely to experience frequent nuisance tripping.</u>

Informational Note No. 1: See UL 1699-2011, *Standard for Arc-Fault Circuit-Interrupters*, for information on combination-type and branch/feeder-type AFCI devices. See UL Subject 1699A, *Outline of Investigation for Outlet Branch Circuit Arc-Fault Circuit-Interrupters*, for information on outlet branch-circuit type AFCI devices. See UL Subject 1699C, *Outline of Investigation for System Combination Arc-Fault Circuit Interrupters*, for information on system combination AFCIs.

Informational Note No. 2: See 29.9.4(5) of *NFPA 72*-2019, *National Fire Alarm and Signaling Code*, for information on secondary power source requirements for smoke alarms installed in dwelling units.

Informational Note No. 3: See 760.41(B) and 760.121(B) for power source requirements for fire alarm systems.

Additional Proposed Changes

File Name	Description	Approved
PC_889_on_FR_9628_Exception3_210.12_B_.docx	Text of PC 889 for reference	

Statement of Problem and Substantiation for Public Comment

This additional exception would provide a window of opportunity to continue the research currently underway among industry stakeholders. With the expansion of AFCIs, this equipment needs more time to address the possibility of unwanted tripping. CMP 2 would be affording stakeholders time to address identified compatibility concerns.
Nuisance trips continue to be a problem that is damaging the credibility of present-day AFCI protection. The primary culprits that appear to be causing nuisance trips are those listed in the exception.

Related Item

• FR-9628

Submitter Information Verification

Submitter Full Name:	Merton Bunker
Organization:	Merton Bunker and Associates, LLC

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Submittal Date:	Wed Aug 04 15:40:30 EDT 2021
Committee:	NEC-P02

Public Comment 889 to FR 9628: Add new exception to current 210.12(B).

Exception No. 1: AFCI protection shall not be required. …<existing exception>

Exception No. 2: AFCI protection shall be required for the individual branch circuit supplying a receptacle for arc welding equipment in a dwelling unit effective January 1, 2025. …<existing exception>

Exception No. 3. AFCI protection shall not be required for the individual branch circuit connected to outlets or receptacle outlets serving equipment including: microwaves, bathroom fans, appliances that incorporate variable speed motors and switching power supplies, other non-linear power conversion equipment, soft-start equipment and other portable equipment likely to experience frequent unwanted tripping.

Substantiation: This additional exception would provide a window of opportunity to continue the research currently underway among industry stakeholders. With the expansion of AFCIs, this equipment needs more time to address the possibility of unwanted tripping. CMP 2 would be affording stakeholders time to address identified compatibility concerns.

Nuisance trips continue to be a problem that is damaging the credibility of present-day AFCI protection. The primary culprits that appear to be causing nuisance trips are those listed in the exception.

Public Comment No. 1758-NFPA 70-2021 [Section No. 210.12(C)]

(C) Dormitory Units.

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) Bedrooms

(2) Living rooms

(3) Hallways

(4) Closets

(5) Bathrooms

(6) Similar rooms

Statement of Problem and Substantiation for Public Comment

FR 9198-NFPA 70-2021 added the requirement to provide AFCI protection for 10-ampere circuits in 210.12(A) but failed to include other areas. This change was implemented with the statement: "With the introduction and availability of 10-ampere branch circuits, 10-ampere branch circuits have been added to the list of circuits requiring AFCI protection."

The new allowances for 10A circuits are not limited to dwelling units. All areas that currently require AFCI protection for 15 and 20-ampere circuits can now have 10-ampere circuits installed. The committee statement in FR 9198-NFPA 70-2021 applies to all other areas where AFCI protection is required. AFCI requirements for each of these areas should be extended to 10-ampere circuits to prevent gaps in coverage.

Related Item

• FR 9198-NFPA 70-2021 • PI 2865-NFPA 70-2020

Submitter Information Verification

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Submittal Date:	Tue Aug 17 16:42:24 EDT 2021
Committee:	NEC-P02

Public Comment No. 167-NFPA 70-2021 [Section No. 210.12(D)]

(D) Other Occupancies.

All 120-volt, single-phase, 15- and 20-ampere branch circuits supplying outlets or devices installed in guest rooms and guest suites of hotels and motels,~~ and in areas used exclusively as patient sleeping rooms in nursing homes and limited-care facilities~~ _ 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~~

Statement of Problem and Substantiation for Public Comment

Article 517 included requirements for health care and these need to be discussed and vetted by CMP-15. Section 90.3 specifically states that chapter 5 covers special occupancies, not chapter 2. Since this requirement has been included in the NEC and in health care facilities that have installed AFCI the number of nuisance trips have significantly increased. This is potentially dangerous when the equipment may be life support equipment, either ventilators or CPAP machines. These devices in health care facilities need to be studied further to understand the potential life impact and risks being introduced into health care facilities.

In addition, the language fails to define where these are required and how they would be applied in many settings. What about critical access hospitals with swing beds? what are the implications of having AFCIs serving hospital beds that swing to nursing home beds? what about Board and Care facilities (NFPA 101)?

In the response to the PI-3382 on this issue, CMP-2 stated that CMP-15 should modify the relevant section in article 517. The Standards Council Decision #19-12 agrees and encourages CMP-15 to make that change. So CMP-15 clearly has jurisdiction to address this requirement in article 517. To eliminate the conflict, this needs to be deleted in 210.12(B)

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 523-NFPA 70-2021 [Section No. 517.10(B)]	
Public Comment No. 523-NFPA 70-2021 [Section No. 517.10(B)]	

Related Item

• PI 3098 • PI 9093 • PI 3382

Submitter Information Verification

Submitter Full Name: Chad Beebe
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Submittal Date: Thu Jul 08 12:30:36 EDT 2021
Committee: NEC-P02

Public Comment No. 1759-NFPA 70-2021 [Section No. 210.12(D)]

(D) Other Occupancies.

All 120-volt, single-phase, 10-, 15- and 20-ampere branch circuits supplying outlets or devices installed in guest rooms and guest suites of hotels and motels, and in areas used exclusively as patient sleeping rooms in nursing homes and limited-care facilities 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

Statement of Problem and Substantiation for Public Comment

FR 9198-NFPA 70-2021 added the requirement to provide AFCI protection for 10-ampere circuits in 210.12(A) but failed to include other areas. This change was implemented with the statement: "With the introduction and availability of 10-ampere branch circuits, 10-ampere branch circuits have been added to the list of circuits requiring AFCI protection."

The new allowances for 10A circuits are not limited to dwelling units. All areas that currently require AFCI protection for 15 and 20-ampere circuits can now have 10-ampere circuits installed. The committee statement in FR 9198-NFPA 70-2021 applies to all other areas where AFCI protection is required. AFCI requirements for each of these areas should be extended to 10-ampere circuits to prevent gaps in coverage.

Related Item

• FR 9198-NFPA 70-2021 • PI 2865-NFPA 70-2020

Submitter Information Verification

Submitter Full Name: Randy Dollar
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Submittal Date: Tue Aug 17 16:47:30 EDT 2021
Committee: NEC-P02

Public Comment No. 2172-NFPA 70-2021 [Section No. 210.12(D)]

(D) Other Occupancies.

All 120-volt, single-phase, 15- and 20-ampere branch circuits supplying outlets or devices installed in guest rooms and guest suites of hotels and motels ~~, and in areas used exclusively as patient sleeping rooms in nursing homes and limited-care facilities~~ 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~~

Statement of Problem and Substantiation for Public Comment

The need for AFCI devices in Nursing Homes and Long Term Care facilities has not been justified by any technical data indicating arc fault fires while the issue of nuisance trips for AFCI for medical equipment has increased. This can cause issue with loss of power to medical equipment that is a possible threat to life.
Nursing homes and Long Term facilities have full time staff that monitor patient sleeping rooms.

Related Item

- PI-3098 and PI-9093

Submitter Information Verification

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Submittal Date:	Thu Aug 19 15:34:44 EDT 2021
Committee:	NEC-P02

Public Comment No. 1523-NFPA 70-2021 [Section No. 210.12(F)]

(F) Sleeping Quarters.

All 120-volt, single-phase, 15 and 20-ampere branch circuits supplying outlets or devices installed in rooms designed ~~exclusively for sleeping in fire houses, rescue squads, police departments,~~ as sleeping quarters, and similar locations shall be protected by any of the means described in 210.12(A)(1) through (A)(6).

Statement of Problem and Substantiation for Public Comment

This comment is being submitted on behalf of the Minnesota Department of Labor and Industry. The Department's 15 office/field staff, and 70 contract electrical inspectors complete over 150,000 electrical inspections annually.

So far, we protect sleeping areas in Dwellings, Guest Rooms and Suites, Limited Care Facilities and Nursing Homes, Dormitories, and now the proposed language with include first responder type buildings, but fail to protect other sleeping areas like bunkhouses, hunting cabins, and finished areas above detached garages. The proposed language would protect all rooms designed as sleeping areas in all types of occupancies.

Related Item

• FR 9167 • PI 3890

Submitter Information Verification

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Submittal Date: Mon Aug 16 10:12:59 EDT 2021
Committee: NEC-P02

Public Comment No. 1760-NFPA 70-2021 [Section No. 210.12(F)]

(F) Sleeping Quarters.

All 120-volt, single-phase, 10-, 15 and 20-ampere branch circuits supplying outlets or devices installed in rooms designed exclusively for sleeping in fire houses, rescue squads, police departments, and similar locations shall be protected by any of the means described in 210.12(A)(1) through (A)(6).

Statement of Problem and Substantiation for Public Comment

FR 9198-NFPA 70-2021 added the requirement to provide AFCI protection for 10-ampere circuits in 210.12(A) but failed to include other areas. This change was implemented with the statement: "With the introduction and availability of 10-ampere branch circuits, 10-ampere branch circuits have been added to the list of circuits requiring AFCI protection."

The new allowances for 10A circuits are not limited to dwelling units. All areas that currently require AFCI protection for 15 and 20-ampere circuits can now have 10-ampere circuits installed. The committee statement in FR 9198-NFPA 70-2021 applies to all other areas where AFCI protection is required. AFCI requirements for each of these areas should be extended to 10-ampere circuits to prevent gaps in coverage.

Related Item

• FR 9198-NFPA 70-2021 • PI 2865-NFPA 70-2020

Submitter Information Verification

Submitter Full Name:	Randy Dollar
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Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Tue Aug 17 16:50:36 EDT 2021
Committee:	NEC-P02

Public Comment No. 2208-NFPA 70-2021 [New Section after 210.13]

210.14 Weight Supporting Ceiling Receptacle (WSCR)) Fall and Shock Protection for Personnel. In bedrooms of one- and two-family dwellings, a listed WSCR shall be installed in all ceiling outlet boxes supplying and supporting luminaires and paddle fans.

This requirement shall become effective on January 1, 2026.

Exception No. 1: A WSCR shall not be required in ceiling outlet boxes for electric-discharge, LED tube-type luminaires or track lighting.

Exception No. 2: A WSCR shall not be required in ceiling outlet boxes for recessed luminaires.

Exception No. 3: A WSCR shall not be required in ceiling boxes for use with fire, carbon monoxide and security system, alarms or detectors.

Exception No. 4: A WSCR shall not be required in outlet boxes for use with cove lighting.

Additional Proposed Changes

File Name	Description	Approved
SupportingMaterial.pdf	Data to show hazards of traditional installations, including numbers of DIYers	

Statement of Problem and Substantiation for Public Comment

Companion Public Comments were submitted to Panels 18 and 9 to revise 410.36 and 314.27(E), respectively. A similar concept was suggested to CMP2 during the First Draft, and has been modified accordingly considering CMP members' feedback and the Panel Resolution statement as follows:

The suggested change would require weight supporting ceiling receptacles (WSCR) to be installed in luminaire and paddle fan outlets in certain areas of one- and two-family dwellings to address fall protection during installation. The ability of the receptacle to reduce falls is uncertain, because it is unknown how many homeowners replace lighting fixtures themselves. The receptacle may need to be replaced if it is the wrong type (regular vs recessed) and will not be required for recessed, track or cove lighting. In addition, there were concerns about compatibility and adaptability issues with luminaires and paddle fans. Improper use of ladders, use of other objects such as chairs contribute to falls.

Changes based on the Panel's resolve statement and input from members individually included the following:

1. BEDROOM ONLY REQUIREMENT. This public comment requires the WSCR in only bedrooms of one- and two-family dwellings because luminaires are frequently changed, sometimes to a paddle fan or a paddle fan with a light kit, and the bed could be an obstruction to safely making the change. Additionally, it is appropriate to implement new and promising technologies in limited applications to vet any potential issues.
2. EFFECTIVE DATE. The date was chosen to allow time for implementation by the industry, including depleting current inventory or inventory retrofitting.
3. STANDARD CONFIGURATION. The configurations have been approved for ANSI/NEMA WD 6, "American National Standard for Wiring Devices -Dimensional Specifications" for standard configurations of weight-supporting ceiling receptacles and weight-supporting attachment fittings.
4. Unknown DIYers? The Panel noted that "…it is unknown how many homeowners replace lighting fixtures themselves". Data from the US Census Bureau's American Housing Survey showed
   -- DIYers do between 36 - 38% of all home improvement projects
   -- DIYers do between 35.2 - 35.9% of all electrical home improvement projects
   It should be noted that "professionals" can include painters and handymen, not just electricians. Typically, there are no inspections for DIY work. See documentation in the attached file.
5. NON-INTERCHANGEABLE. The Panel noted, "there were concerns about compatibility and adaptability issues with luminaires and paddle fans". The WSCR for luminaires is keyed so that it will only accept the WSAF for luminaires. The WSCR for paddle fans is a more robust receptacle, which is designed to support up to 70-pounds and the vibration from the dynamic load of a fan. The WSCR for luminaires is designed to support up to a 50-pound static luminaire load. The keyed luminaire receptacle will prevent the installation of the WSAF for heavier paddle fans. The designs are in NEMA WD 6.
6. PLACEMENT. The placement in Article 210 is because it is a mitigation method similar to other protection methods found in Article 210. This connector application provides shock and fall mitigation during installation and cleaning that is similar in philosophy to the concepts behind GFCI and AFCI for shock and fire protection. Once installed, the WSCR will mitigate shock hazard during installation by reducing the need to work inside outlet boxes when conductors are energized. It will provide fall protection by limiting both falls from unbalance and from the shock hazards that can result in falls and by reducing the time spent on ladders. The WSCR has been determined to be compatible with all known ceiling outlet boxes.
7. DOES WSCR REDUCE TIME ON LADDERS? See the installation video at https://www.youtube.com/watch?v=2ZB7qEIT8LA that shows just minutes to install the WSCR versus 15+ minutes to install the traditional wiring for a professional. Then just seconds with the luminaire or paddle fan to insert the WSAF into the WSCR. You're still on the ladder, but it is significantly less time, and less time with a luminaire or paddle fan while wiring.

WHY NOT? BECAUSE IT WAS ALWAYS DONE THAT WAY…? When overhead lighting is going to be installed, why does the initial luminaire installation or future luminaire changes have to be hard-wired? Now technology exists to mitigate the hazards, as discussed here and should become mandatory for safety. Nobody would be using seatbelts and many other safety devices if they weren't mandatory – they just wouldn't be available.

WHY SHOULD A NEW SECTION BE ADDED? The WSCR/WSAF increases safety by simplifying installation and most importantly, reducing the need to touch exposed conductors while installing luminaires. A fundamental principle of safety is to engineer out the hazard. By engineering out the hazard, the human factors contributing to injuries or deaths are mitigated. The new section will increase safety for the initial installation and for future exchanges of luminaires and paddle fans in one- and two-family dwellings. By requiring this technology, safety is also increased as inspectors can ensure the wiring polarity is correct, unlike with traditional wiring for luminaire

installations. The inspection is done with a commonly available standard polarity tester and attachment adapter for the WSCR.
Many times, a review of data provides only a small sense of issues in the field without the true magnitude. We all know that people can get injured or fall while installing luminaires. One example of a data set is from the CPSC, which shows 32 emergency room visits in a 5-year period that resulted from falls during luminaire installation. OSHA requires reporting of all accidents in the workplace. However, CPSC doesn't learn about every accident involving consumers because consumers aren't obligated to report accidents to the commission. In fact, most consumers would not report the accident because it had nothing to do with a defective product. So, the reporting only includes the incidents that have come to the attention of the CPSC. However, data collected by the Centers for Disease Control and Prevention clearly indicates that the number one cause of accidents in the workplace and at home is falls. See the additional supporting material provided with this comment that provides more detailed data. The CDC data does not capture what the person was doing when he or she fell. It does prove that work on ladders and other platforms is dangerous and can lead to injuries. Work on electrical equipment while on ladders introduces an additional level of complexity to an already dangerous situation. The person is joining wires, using tools and supporting the weight of the equipment, all while trying to maintain balance. For many, the work is the equivalent of juggling on a ladder. The weight supporting ceiling receptacle (WSCR) in concert with the weight supporting attachment fitting (WSAF) will significantly reduce the juggling and overall amount of time spent on ladders.
For new construction, the wiring is not normally energized until after the installation is complete. For existing dwellings, the circuit breaker should be opened to mitigate the electrical hazard. The reality is that many professional electricians, handymen and homeowners either may not turn off the breaker or may turn off the wrong breaker.
DATA TO SUBSTANTIATE – SUMMARY OF SUPPORTING MATERIAL. A significant amount of information was collected and analyzed for this public comment, including information from the U.S. Census Bureau, OSHA, NIOSH, CPSC, and CDC. It is included in the attached supporting material.
DEATHS AND INJURIES REPORTED. Information from OSHA, NIOSH, CPSC, and CDC is based on reported accidents. OSHA and NIOSH data is reported in accordance with workplace accident reporting regulations. CPSC data is based on incidents that come to the attention of CPSC. Persons who are injured are not required to report their injuries to CPSC, so the information may be incomplete.
The data on falls is based on reports from hospitals and clinics, which is contained in the WISQARS database. Two separate reports are presented, one for fatalities and one for non-fatal injuries.
<SEE ATTACHMENT FOR SUPPORTING DATA>
Safety in the NEC is a continuing evolution. When the screw shell lampholder design was standardized, why wasn't a weight supporting quick-connect option for luminaires and ceiling fans also included? Simply put, because it didn't exist. Most electrical equipment in the home is plug and play, except ceiling luminaires and paddle fans. Furthermore, most homeowners would like to be able to change both luminaires and paddle fans.
One example of code and technology evolution is the use of a 2-wire lighting socket screw-shell adapter to power appliances. Evolution brought 2-wire receptacles for this purpose and these evolved to 3-wire grounded receptacles, some of which became GFCI-type receptacles. Advancements in technology coupled with the need to improve safety is the fundamental principle of the NEC.
DANGERS OF DOING IT THE "OLD" WAY. From your own experience, you understand the dangers of working on a ladder (with or without the luminaire or paddle fan) while wiring. Do you realize that, excluding motor vehicle accidents, falls are the #1 cause of injuries in construction (US Census Bureau BLS, 2019), which includes electricians? The data in the attached report validates your own experiences of strains and falls. Shouldn't the wiring be done once, similar to any other receptacle, and the luminaire or paddle fan simply plugged in afterwards?
IT IS TIME TO TAKE ANOTHER STEP IN THE EVOLUTION TO FURTHER IMPROVE SAFETY.
HAZARDS FROM THE DIY INSTALLATION
-- Incorrect installations go undetected
    -- Incorrect wiring causing shorts and shocks
    -- Incorrect support causing luminaires/paddle fans to fall or damage wires
    --Loss of grounding/bonding connections
-- Falls from ladders during installation from:
    -- Shocks
    -- Unsteadiness and losing balance
    -- Awkwardness of handling luminaires/paddle fans while connecting wires
-- Shocks during installation of replacement luminaires/paddle fans due to exposure of live wires

SIMPLER MAINTENANCE
-- Easy removal for cleaning luminaires/paddle fans and bulb replacement
-- Easy removal and reinstallation for painting the ceiling
-- Quick install/removal of luminaires/paddle fans

IF THE WORK IS DONE BY PROFESSIONALS, WHO ARE "PROFESSIONALS" INSTALLING LIGHTING/CEILING FANS? How many of the professional home improvement projects include an electrical professional on the team? Is the electrical work being performed by painters? Carpenters? Drywallers? Home handymen?
-- The CPSC estimates there are 4 electrocution deaths per year associated with lighting products (Hnatov, 2009) that they have been able to identify. One death is one too many.
    -- CPSC data from the National Electronic Injury Surveillance System (NEISS) database (CPSC, 2019) from 2009 to 2013 revealed 38 incidents resulting in hospital emergency room visits involving the installation of luminaires; 32 of those incidents involved falls and at least four of those incidents involved the victims being shocked.
CEILING FAN RECALLS
The CPSC website lists a number of ceiling fan and luminaire recalls (CPSC, 2018). If the WSCR had been installed, the luminaire could be easily replaced by the homeowner, minimizing shock and fall hazards.
THE SOLUTION
The proposed solution is an innovative advance that makes the installation of luminaires/paddle fans safer not just for the current installation, but for future replacements. With WSCRs installed during initial construction by electrical professionals there is:
-- a quick connect/disconnect capability (similar to a standard receptacle)
-- support of the weight of the luminaire/paddle fan
-- no supporting the weight or bulk of the luminaire/paddle fan during the receptacle installation
-- no additional rewiring necessary to install the new luminaire/paddle fan
-- no shock hazard during the quick connect of the luminaire/paddle fan

The WSCR is an advance that makes the installation of luminaires and paddle fans safer not just for the current installation, but for future replacements. For the initial installation, the only "weight" the installer has to deal with is the WSCR which is ounces not pounds.
Without the weight/bulk, the falls may not have occurred. With the new technology WSCR in place, the initial installation of the luminaire and any replacement is a quick connect and no shock would have occurred.

If the WSCR and WSAF are required, homeowners and other installers would be protected from shock and fall accidents. They would also be more able to change luminaires/paddle fans at will, which would significantly increase the market.
The solution makes the initial installation safer and provides that future lighting replacements do not require the homeowner to come in contact with potentially live wiring. The WSCR and WSAF configurations protect homeowners and other DIY installers and make lighting replacements simple.

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National Electronic Injury Surveillance System On-Line Query System U.S. Consumer Products Safety Commission. (2019, July 08). Retrieved July 09, 2020, from https://www.cpsc.gov/cgibin/NEISSQuery/home.aspx

Related Item

- PI 3422

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Committee: NEC-P02

PROBLEMS AND SOLUTIONS SUMMARY

Problem: Traditional wiring

Existing practices allow wiring of luminaires and paddle fans that can result in faulty installations or hazards that can include:

- Shocks, electrocutions, injuries & death
- Fires & shorts
- Exposure & contacting energized conductors
- Incorrect & sloppy wiring
- Splicing wires while on a ladder
- Straining of conductors & connectors holding the weight of luminaire during installation
- Incorrect installations go undetected
  - Loss of grounding/bonding connections
- Incorrect support causing luminaires/paddle fans to fall or damage wires
- Falls from ladders during installation from:
  - Shocks
  - Unsteadiness and losing balance
  - Awkwardness - handling while connecting wires

Solution: Weight Supporting Ceiling Receptacle (WSCR)

Plugging-in luminaires & paddle fans using the WSCR & Weight Supporting Attachment Fitting (WSAF) will eliminate and/or reduce risk of faulty wire installations and can:

- Reduce shocks, electrocutions, injuries & deaths
- Eliminate the need to touch wires; no exposed wires
- Prevent fires due to incorrect or sloppy wiring
- Provide a means to check polarity
- Eliminate straining of conductors & connectors holding the weight of luminaire during installation
- Eliminate splicing wires while on a ladder
- Reduce majority of time on ladders (unsteadiness & losing balance
- Reduce awkwardness of handling luminaires/paddle fans while connecting wires

Supporting Data for Public Comment

REQUIREMENTS FOR WEIGHT SUPPORTING CEILING RECEPTACLE (WSCR) AND WEIGHT SUPPORTING ATTACHMENT FITTING (WSAF)

Table of Contents

MANY DIY'ERS MAKE THIS TECHNOLOGY CRUCIAL FOR SAFETY

Large Support Network for Do It Yourselfers

There is a significant market for do-it-yourself home improvement. Big-box retailers have sprung up across North America that supply products directly to the consumer. There are 2,286 North American Home Depot stores, 2155 Lowe's Stores, 5000 Ace Hardware stores, 3800 True Value stores, 4500 Do it Best stores, 1000 Harbor Freight stores and others that supply inexpensive tools to many of the DIYers. The DIY market is also supported by all sorts of You Tube videos, some of which is vendor supported, but much of which is generated by someone who may not be an expert. In addition, the Home and Garden TV Network (HGTV) has convinced many that they can make large profits by buying distressed existing home and flipping them. This has also encouraged homeowners to improve their own homes.

The big box stores are known for having large lighting departments that have extensive displays of fixtures. Many can arrange for a local contractor to do the installation. However, many consumers are taking on the project themselves or having some unlicensed handyman do the installation work.

The public comments will propose to require that lighting outlets utilize listed WSCR and WSAF (locking support-type receptacles to connect to compatible attachment fittings) on luminaires and paddle fans. The use of the WSCR and WSAF simplify the replacement of luminaires and paddle fans. The use of the WSCR and WSAF limits the exposure to energized parts for future fixture replacements. Falls from ladders are a safety problem for professionals in the workplace. They are also a safety problem in the home. Simplifying the replacement process limits the time spent on ladders, and reduces the extended reach from higher ladder steps, minimizing the number of falls.

Fixtures have varying degrees of installation complexity and a variety of fastening means. There is also a lot of variety of degrees of assembly that is required. Some of assembly might take place on the ladder. With WSCR and WSAF, all of the assembly can take place off the ladder and the completed assembly can simply be raised into position and plugged in.

Renovation Statistics

The American Housing Survey, produced by the Census Bureau is generated every two years[1]. One of the many factors analyzed is home renovations. The survey analyzes professional and DIY renovations. The statistics appear to show a level percentage of DIY renovations out of the total number of renovations for each reporting period. Some renovations can easily be

[1] *U. S. Census Bureau, American Housing Survey*. (n.d.). Retrieved July 20, 2020, from https://www.census.gov/programs-surveys/ahs/data/interactive/ahstablecreator.html?s_areas=00000&s_year=2011&s_tablename=TABLE16&s_bygroup1=24&s_bygroup2=1&s_filtergroup1=1&s_filtergroup2=1.

performed by the homeowner. Surprisingly, the statistics also show a fairly consistent percentage of electrical renovations that are DIY. Permits are rarely taken out for DIY equipment replacements or renovations. That is sometimes the case with flipped homes. As a result, DIY work is rarely inspected by jurisdictional electrical inspectors. Even when permits are taken out, there is no guarantee that the work will be performed by professionals or that it will be inspected. Many jurisdictions will only spot check the work of homeowners because inspections cost money and if there is no inspection, the jurisdiction can just collect the permit fee. For those who are classified as professional, how many of the practitioners are electricians? How many are just handymen? Figures 1 through 4 illustrate the percentages of home improvement projects for a two-year period ending in 2017, 2015, 2013, and 2011. Figure 5 illustrates all of the electrical home improvement projects reported by the survey from 2010 through 2017. The background data is in Annex A.

FIGURES 1-4: LARGE PERCENTAGE OF HOME IMPROVEMENTS DONE BY DIY'ers; "PROFESSIONALS" CAN INCLUDE PAINTERS AND HANDYMEN, NOT ALWAYS ELECTRICIANS.

Figure 1.

* Professionals include handyman/painters/electricians

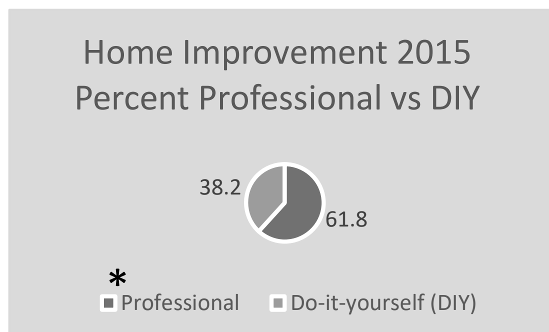


Figure 2.

* Professionals include handyman/painters/electricians

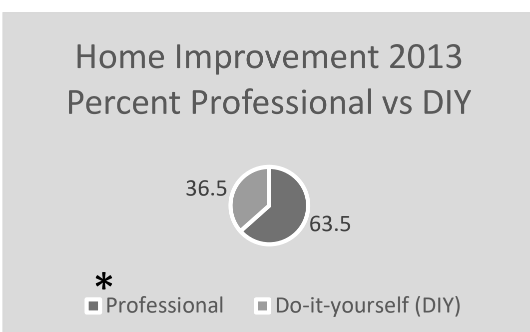


Figure 3.

* Professionals include handyman/painters/electricians

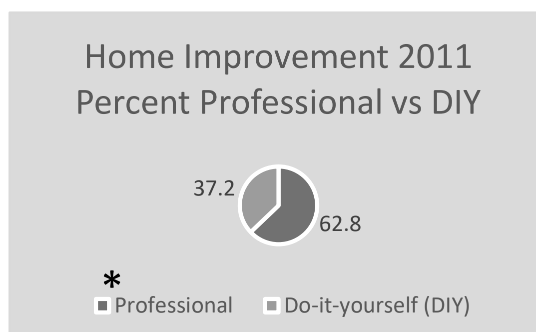
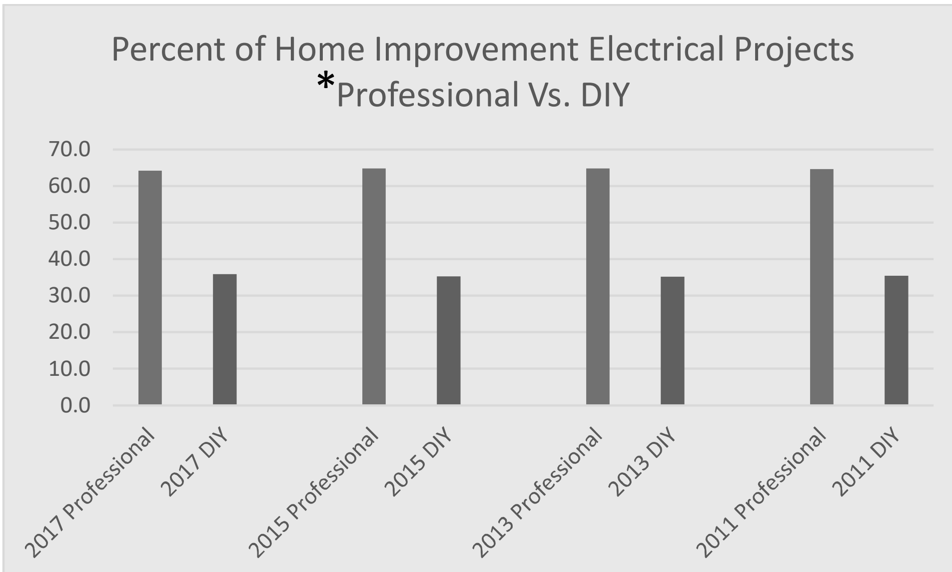


Figure 4.

* Professionals include handyman/painters/electricians

Electrical Home Improvement Projects

The number of people who are willing to do electrical work themselves has been a similar percentage to that of all DIY projects. It has also remained steady over the study periods of the survey. The raw statistics are included to provide a clearer picture of the types of home improvement projects undertaken. Many of the interior renovations likely include some electrical work, which may or may not be included separately as electrical work.



*Professionals include handyman/painters/electricians

Figure 5.

NFPA Residential Fire Statistics

NFPA estimates that 17,600 home fires in the US that are caused by faulty wiring connected with ceiling fans and lights (https://www.nfpa.org/-/media/Files/News-and-Research/Fire-statistics-and-reports/Building-and-life-safety/oshomes.pdf) The report notes "Electrical distribution or lighting equipment was the leading cause of home fire property damage. An average of 35,000 such fires caused 500 deaths; 1,130 injuries; and $1.4 billion in direct property damage per year. Wiring and related equipment accounted for 7 percent of all home fires and 10 percent of all home fire deaths. Cords or plugs were involved in only 1 percent of the fires but 6 percent of the deaths. Extension cords dominated the cord or plug category. More information is available in the NFPA report, *Electrical Fires*[2]."

[2] Campbell, R. (2019, March). *Electrical Fires* (Tech.). Retrieved July 20, 2020, from National Fire Protection Association website: https://www.nfpa.org/News-and-Research/Data-research-and-tools/Electrical/Electrical

The following table notes fire statistics for lighting and distribution equipment. This is a rather broad category. There is a separate category for ceiling fans. It appears that fans category includes bathroom vent fans. It may also include kitchen exhaust fans.

Table 5.
Home Fires Involving Electrical Failure or Malfunction as Factor Contributing to Ignition by Equipment Involved in Ignition, 2012-2016 Annual Averages

Equipment Involved	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Electrical distribution and lighting equipment	**22,620**	**(50%)**	**310**	**(71%)**	**700**	**(56%)**	**$786**	**(62%)**
Wiring and related equipment	17,600	(39%)	190	(43%)	440	(35%)	$588	(46%)
Cord or plug	2,080	(5%)	100	(23%)	130	(11%)	$85	(7%)
Lamp, bulb or lighting	1,850	(4%)	10	(3%)	70	(5%)	$64	(5%)
Transformers and power supplies	1,080	(2%)	10	(2%)	60	(5%)	$49	(4%)

Later on, NFPA's *Electrical Fires* report contains the following table, which, for the same time period has different and larger numbers:

Table 14.
Home Fires Involving Electrical Distribution and Lighting Equipment, by Equipment Involved in Ignition 2012-2016 Annual Averages

Equipment Involved	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Wiring and related equipment	24,780	(67%)	270	(55%)	640	(53%)	$853	(67%)
Lamp, bulb or lighting	4,970	(13%)	40	(9%)	200	(17%)	$164	(13%)
Cord or plug	3,330	(11%)	160	(33%)	230	(19%)	$143	(11%)
Transformers and power supplies	2,060	(9%)	20	(3%)	130	(11%)	$108	(9%)
Other known equipment involved in ignition	20	(0%)	0	(0%)	0	(0%)	$0	(0%)
Total	35,150	(100%)	490	(100%)	1,200	(100%)	$1,270	(100%)

Injury Reports

OSHA Reports. Falls from ladders are a frequent hazard. They happen in commercial and industrial settings as well as in residential situations. For example: in the OSHA electrocution training materials, an OSHA Fatal Fact is presented[3] that details a union electrician's death by electrocution during trouble shooting with lamps. The shock caused the electrician to fall off the ladder (OSHA Incident Report #0418800).[4]

Another example: in 2011, an electrician was electrocuted when the wires of a light fixture he was attempting to hang became stripped energizing the light fixture. As he grabbed one of the attached steel hanging cables, he received a fatal shock (OSHA Incident Report #0317700).[5] It is reasonable to conclude that this incident could have been avoided if the new technology receptacle/attachment fitting technology had been used because the fixture could not have become energized, as there would be no access to electricity through the disconnected fixture.

NIOSH Reports. The National Institute for Occupational Safety and Health (NIOSH) conducts the Fatal Accident Circumstances and Epidemiology (FACE) Project. Data are collected from a sample of fatal accidents, including electrical-related fatalities.

For example: NIOSH FACE Report 87-55[6] summarized a 1987 electrocution of a North Carolina electrician. While repairing a fluorescent light fixture over a kitchen sink in a single-family residence, a 33-year-old journeyman electrician was electrocuted when he contacted an energized wire on the load side of the ballast (400 volts). The ballast had been replaced. However, he could not get the light to operate properly. The electrician was sitting on the sink when he apparently contacted an energized wire on the load side of the ballast. The circuit had not been de-energized at the panel box or at the single-pole switch on the wall beside the sink.

It is reasonable to conclude that this incident might have been avoided if the WSCR/WSAF technology had been used. The receptacle would've already been installed, and the fixture could've been taken down through a simple quick disconnect for examination. If the fixture was determined to be in working order, additional work could be completed with the fixture

[3] Construction Focus Four: Electrocution Hazards, Instructor Guide. OSHA Training Institute, OSHA Directorate of Training and Education, April 2011. Document can be found online at https://www.osha.gov/dte/outreach/construction/focus_four/electrocution/electr_ig.pdf

[4] OSHA Report ID: 0418800 can be found at https://www.osha.gov/pls/imis/establishment.inspection_detail?id=18396960

[5] OSHA Report ID: 0317700 can be found at https://www.osha.gov/pls/imis/establishment.inspection_detail?id=314163627[6] NIOSH Face Reports 1982 to 2005 including 87-55 can be found at http://wwwn.cdc.gov/NIOSH-FACE/Default.cshtml?state=ALL&Incident_Year=ALL&Category2=0006&Submit=Submit#.VFjs8y7-DK0.email. This particular report can be located directly at http://www.cdc.gov/niosh/face/In-house/full8755.html

[6] NIOSH Face Reports 1982 to 2005 including 87-55 can be found at http://wwwn.cdc.gov/NIOSH-FACE/Default.cshtml?state=ALL&Incident_Year=ALL&Category2=0006&Submit=Submit#.VFjs8y7-DK0.email. This particular report can be located directly at http://www.cdc.gov/niosh/face/In-house/full8755.html

[7] 2004 Electrocutions Associated with Consumer Products, By Matthew V. Hnatov. Hazard Analysis Division, Directorate for Epidemiology, Consumer Products Safety Commission. April 2009

quickly disconnected and out of the vicinity so full attention could be given to the wiring. If the new technology had been used, the electrocution might have been avoided.

CPSC Data. It is important to note that CPSC data includes only the data the CPSC becomes aware of, and it is understood that there are many other incidents that are not reported or do not come to their attention. Consumers are not obligated to report incidents to the CPSC. The research from the National Electronic Injury Surveillance System (NEISS) database from 2009 to 2013 included the following:

- CPSC estimates 4 electrocution deaths per year associated with lighting products.[7]
- There were 38 incidents involving the installation of light fixtures that resulted in hospital emergency room visits;
- 32 of those incidents involved falls and at least four of those incidents involved the victims being shocked.

With the new technology, after the receptacle is installed in the ceiling, there is no additional wiring necessary, no weight or bulk of the fixture during the initial receptacle installation, certainty of connection of the fixture to the equipment grounding conductor, and no shock hazard during the quick connect of the fixture. Without the weight/bulk, the falls may not have occurred. With the new technology receptacle in place, installation of the luminaire is a quick connect and no shock would have occurred.

- There were 418 incidents involving changing light bulbs that resulted in hospital emergency room visits;
- 390 involved falls and at least six of those incidents involved the victims being shocked.
- There were 9 additional incidents associated with cleaning the light fixture that resulted in hospital emergency room visits; 8 of those involved falls.

Many of these incidents could have been avoided or minimized if the new technology receptacle/attachment fitting technology had been used. The fixture is simply disconnected and any bulb or fixture maintenance or cleaning can be done on a table, not at an elevation, thereby reducing the time at an elevated level, thereby reducing the hazard.

- There were 55 incidents involving a luminaire falling from the ceiling onto the victim that resulted in hospital emergency room visits.

If the receptacle/attachment fitting (WSCR/WSAF) technology had been used, many of these incidents could have been avoided or minimized. The new technology must pass weight support requirements in the UL product safety standards well beyond what the NEC permits.

[7] 2004 Electrocutions Associated with Consumer Products, By Matthew V. Hnatov. Hazard Analysis Division, Directorate for Epidemiology, Consumer Products Safety Commission. April 2009

The NEC does not permit the assembly to support a luminaire weighing more than 50 lbs or a ceiling fan weighing more than 70 lbs, therefore the fixtures would not fall.

CDC Data. According to the Centers for Disease Control and Prevention (CDC), falls are the number one cause of injury. From 2001-2017, there were 144,895,242 falls reported to CDC. During the same period, there were 443,576 deaths from falls. It is not unreasonable to assume that many of these falls involved working on a luminaire. Ladder related accidents are common. In addition, some will resort to stools, chairs, and chairs with boxes or books on them to get to the right height. Detailed information can be found in Annex B. There is little information on what the victims were doing when they fell.

In 1997, Industrial Safety and Hygiene News (ISHN) noted "According the American Academy of Orthopedic Surgeons, every year 500,000 people are treated for ladder-related injuries and approximately 300 of these incidents prove to be fatal. The Liberty Mutual Research Institute for Safety found that in 2007 alone, more than 400 people died as a result of falls on or from ladders or scaffolding[8].

Summary

When viewing data contained in the Annexes, it is important to note that there is no way to know the exact number of improper installations. For example, if there were one million annual installations of luminaires (it could be argued that there are significantly *more* annual installations per Annex A) and just 2% of them were improperly installed by an untrained do-it-yourselfers, that would result in 20,000 improperly installed luminaires.

[8] 500,000 Falls from Ladders Annually; 97 Percent Occur at Home or on Farms. (July 6, 2017). *Industrial Safety and Hygiene News*. Retrieved July 20, 2020, from https://www.ishn.com/articles/106830-000-falls-from-ladders-annually-97-percent-occur-at-home-or-on-farms

Annex A. Home Renovations Reported in the American Housing Survey

Survey Notes: Estimates and Margins of Error in thousands of housing units, except as indicated. Medians are rounded to four significant digits as part of disclosure avoidance protocol. Margin of Error is calculated at the 90% confidence interval. Weighting consistent with Census 2010. Blank cells represent zero; Z rounds to zero; '.' Represents not applicable or no cases in sample; S represents estimates that did not meet publication standards or withheld to avoid disclosure.

Characteristics	Professional/Do-It-Yourself Total Estimate	Professional Estimate	Do-It-Yourself Estimate
HOME IMPROVEMENT ACTIVITY IN LAST TWO YEARS (2017)			
Total			
Number of projects (1,000)	113,155	69,975	43,181
Median expenditures ($)	1,364	2,408	600
Total expenditures (1,000)	450,089,818	368,366,827	81,722,991
Disaster Repairs[1]			
Earthquake			
Number of projects (1,000)	S	S	S
Median expenditures ($)	S	S	300
Total expenditures (1,000)	S	S	S
Tornado/hurricane			
Number of projects (1,000)	418	303	115
Median expenditures ($)	7,000	7,000	S
Total expenditures (1,000)	4,490,105	3,276,862	S
Landslide			
Number of projects (1,000)	S	S	.
Median expenditures ($)	6,020	6,020	.
Total expenditures (1,000)	S	S	.
Fire			

Number of projects (1,000)	113	85	S
Median expenditures ($)	10,000	10,000	S
Total expenditures (1,000)	S	S	S
Flood			
Number of projects (1,000)	197	121	76
Median expenditures ($)	S	13,500	S
Total expenditures (1,000)	5,283,698	S	S
Other			
Number of projects (1,000)	867	734	133
Median expenditures ($)	9,500	10,500	3,800
Total expenditures (1,000)	10,898,601	10,190,039	708,562
Room Additions and Renovations			
Bedroom			
Number of projects (1,000)	419	184	235
Median expenditures ($)	7,000	23,000	2,000
Total expenditures (1,000)	7,289,971	6,000,692	1,289,280
Bath			
Number of projects (1,000)	274	162	112
Median expenditures ($)	6,400	10,000	4,000
Total expenditures (1,000)	3,258,882	2,493,137	765,746
Recreation Room			
Number of projects (1,000)	196	105	91
Median expenditures ($)	S	24,000	3,750
Total expenditures (1,000)	4,880,565	3,875,457	S
Kitchen			
Number of projects (1,000)	159	94	65
Median expenditures ($)	S	30,000	S
Total expenditures (1,000)	4,559,506	3,686,182	S
Other			

Number of projects (1,000)	827	444	383
Median expenditures ($)	6,500	12,500	S
Total expenditures (1,000)	13,508,584	11,125,843	2,382,741
Remodeling,			
Bath			
Number of projects (1,000)	5,739	3,001	2,738
Median expenditures ($)	3,000	5,250	1,500
Total expenditures (1,000)	35,305,520	26,856,855	8,448,665
Kitchen			
Number of projects (1,000)	4,184	2,358	1,826
Median expenditures ($)	6,000	10,000	3,000
Total expenditures (1,000)	49,553,906	37,772,420	11,781,486
Exterior Additions and Replacements,			
Attached garage/carport			
Number of projects (1,000)	736	389	347
Median expenditures ($)	2,800	4,500	2,200
Total expenditures (1,000)	6,120,015	4,365,016	1,754,999
Porch/deck/patio/terrace			
Number of projects (1,000)	3,331	1,798	1,533
Median expenditures ($)	2,500	4,400	1,000
Total expenditures (1,000)	18,805,519	14,757,663	4,047,856
Roofing			
Number of projects (1,000)	6,766	5,656	1,110
Median expenditures ($)	6,000	6,800	2,200
Total expenditures (1,000)	50,222,041	45,937,650	4,284,391
Siding			
Number of projects (1,000)	1,937	1,264	672
Median expenditures ($)	3,000	4,800	920

Total expenditures (1,000)	9,468,686	8,030,873	1,437,813
Windows/doors			
Number of projects (1,000)	7,443	4,799	2,644
Median expenditures ($)	1,400	2,300	500
Total expenditures (1,000)	24,777,309	21,119,910	3,657,399
Chimney/stairs/other exterior additions			
Number of projects (1,000)	1,531	1,087	444
Median expenditures ($)	1,072	1,440	480
Total expenditures (1,000)	3,856,308	3,133,861	722,448
Interior Additions and Replacements			
Insulation			
Number of projects (1,000)	2,712	1,451	1,261
Median expenditures ($)	750	1,250	400
Total expenditures (1,000)	3,886,216	2,948,857	937,359
Water pipes			
Number of projects (1,000)	3,014	1,792	1,221
Median expenditures ($)	550	1,000	200
Total expenditures (1,000)	4,549,002	3,972,440	576,562
Plumbing fixtures			
Number of projects (1,000)	8,192	3,924	4,268
Median expenditures ($)	400	700	250
Total expenditures (1,000)	10,766,188	8,227,445	2,538,743
Electrical wiring/fuse boxes/breaker switches			
Number of projects (1,000)	4,487	2,879	1,609
Median expenditures ($)	600	1,000	300
Total expenditures (1,000)	6,388,526	5,088,660	1,299,866
Security system			
Number of projects (1,000)	4,286	2,933	1,353

Median expenditures ($)	400	400	400
Total expenditures (1,000)	2,605,279	1,732,909	872,370
Flooring/carpeting/paneling/ceiling tiles			
Number of projects (1,000)	10,438	6,364	4,074
Median expenditures ($)	2,000	2,875	920
Total expenditures (1,000)	33,135,645	26,515,795	6,619,850
HVAC			
Number of projects (1,000)	9,930	8,571	1,359
Median expenditures ($)	3,600	4,000	2,000
Total expenditures (1,000)	43,413,330	39,616,745	3,796,585
Septic tank			
Number of projects (1,000)	355	300	55
Median expenditures ($)	3,000	3,000	S
Total expenditures (1,000)	1,474,779	1,387,439	S
Water heater/dishwasher/garbage disposal			
Number of projects (1,000)	14,569	8,457	6,113
Median expenditures ($)	500	700	400
Total expenditures (1,000)	10,813,487	7,882,752	2,930,735
Other interior			
Number of projects (1,000)	1,901	1,250	651
Median expenditures ($)	1,700	2,143	1,000
Total expenditures (1,000)	S	S	1,348,948
Lot or Yard Additions & Replacements			
Driveways/walkways			
Number of projects (1,000)	3,858	2,627	1,231
Median expenditures ($)	1,800	2,640	550
Total expenditures (1,000)	12,015,598	10,545,199	1,470,399
Fencing/walls			

Number of projects (1,000)	4,449	2,303	2,146
Median expenditures ($)	1,300	2,600	601
Total expenditures (1,000)	10,140,802	7,603,533	2,537,269
Swimming pool/tennis court/recreational structures			
Number of projects (1,000)	967	537	431
Median expenditures ($)	3,500	7,500	748
Total expenditures (1,000)	11,131,910	10,170,999	960,911
Shed/detached garage/other building			
Number of projects (1,000)	2,337	1,095	1,243
Median expenditures ($)	2,000	3,100	1,000
Total expenditures (1,000)	11,680,657	7,570,385	4,110,272
Landscaping/sprinkler system			
Number of projects (1,000)	5,541	2,279	3,262
Median expenditures ($)	900	2,000	500
Total expenditures (1,000)	13,390,741	9,353,303	4,037,438
Other			
Number of projects (1,000)	964	612	352
Median expenditures ($)	2,000	3,000	500
Total expenditures (1,000)	4,583,936	4,169,719	414,217

Characteristics	Professional/Do-It-Yourself Total Estimate	Professional Estimate	Do-It-Yourself Estimate
HOME IMPROVEMENT ACTIVITY IN LAST TWO YEARS (2015)			
Total			
Number of projects (1,000)	123,481	76,277	47,204
Median expenditures ($)	1,200	2,000	600
Total expenditures (1,000)	431,497,494	347,110,853	84,386,641
Disaster Repairs			
Earthquake			
Number of projects (1,000)	23	13	S
Median expenditures ($)	S	S	S
Total expenditures (1,000)	194,698	172,620	S
Tornado/hurricane			
Number of projects (1,000)	339	263	76
Median expenditures ($)	6,000	7,000	S
Total expenditures (1,000)	3,171,864	2,692,720	S
Lightning/fire			
Number of projects (1,000)	142	92	50
Median expenditures ($)	S	S	S
Total expenditures (1,000)	5,161,751	S	S
Flood			
Number of projects (1,000)	211	139	72
Median expenditures ($)	8,150	8,685	S
Total expenditures (1,000)	2,999,016	S	S
Other			
Number of projects (1,000)	823	708	115

Median expenditures ($)	8,550	9,000	3,000
Total expenditures (1,000)	10,029,780	9,309,961	S
Room Additions and Renovations			
Bedroom			
Number of projects (1,000)	516	259	257
Median expenditures ($)	5,000	17,000	2,000
Total expenditures (1,000)	10,997,017	8,903,760	2,093,257
Bath			
Number of projects (1,000)	303	162	141
Median expenditures ($)	S	10,000	2,500
Total expenditures (1,000)	3,463,143	2,847,832	615,311
Recreation Room			
Number of projects (1,000)	253	124	130
Median expenditures ($)	S	15,000	2,800
Total expenditures (1,000)	3,036,052	2,510,855	525,197
Kitchen			
Number of projects (1,000)	198	133	65
Median expenditures ($)	12,110	15,000	5,000
Total expenditures (1,000)	4,355,845	3,925,883	S
Other			
Number of projects (1,000)	861	453	408
Median expenditures ($)	5,000	8,000	2,000
Total expenditures (1,000)	9,920,768	7,905,575	2,015,193
Remodeling			
Bath			
Number of projects (1,000)	6,547	3,406	3,141
Median expenditures ($)	3,000	5,000	1,500
Total expenditures (1,000)	37,537,408	28,304,879	9,232,529

Kitchen			
Number of projects (1,000)	4,740	2,595	2,145
Median expenditures ($)	5,000	7,000	3,000
Total expenditures (1,000)	47,380,831	34,471,023	12,909,808
Exterior Additions and Replacements			
Attached garage/carport			
Number of projects (1,000)	717	403	314
Median expenditures ($)	4,000	5,000	2,500
Total expenditures (1,000)	5,304,691	3,745,563	1,559,127
Porch/deck/patio/terrace			
Number of projects (1,000)	3,616	1,953	1,663
Median expenditures ($)	2,500	4,000	1,200
Total expenditures (1,000)	18,899,196	14,824,455	4,074,741
Roofing			
Number of projects (1,000)	8,035	6,543	1,492
Median expenditures ($)	5,500	6,000	2,500
Total expenditures (1,000)	52,948,893	47,088,310	5,860,584
Siding			
Number of projects (1,000)	2,275	1,607	667
Median expenditures ($)	3,000	4,000	1,000
Total expenditures (1,000)	12,524,667	10,787,609	1,737,057
Windows/doors			
Number of projects (1,000)	8,693	5,580	3,114
Median expenditures ($)	1,500	2,000	600
Total expenditures (1,000)	27,257,002	22,199,593	5,057,410
Chimney/stairs/other exterior additions			
Number of projects (1,000)	1,479	983	496
Median expenditures ($)	1,050	1,500	450
Total expenditures (1,000)	3,427,485	2,944,792	482,694

Interior Additions and Replacements			
Insulation			
Number of projects (1,000)	3,531	1,862	1,669
Median expenditures ($)	750	1,200	400
Total expenditures (1,000)	4,991,329	3,779,128	1,212,201
Water pipes			
Number of projects (1,000)	3,540	2,080	1,461
Median expenditures ($)	500	900	200
Total expenditures (1,000)	5,259,795	4,233,234	1,026,561
Plumbing fixtures			
Number of projects (1,000)	9,116	4,313	4,804
Median expenditures ($)	400	550	250
Total expenditures (1,000)	9,667,129	6,882,298	2,784,831
Electrical wiring/fuse boxes/breaker switches			
Number of projects (1,000)	5,018	3,249	1,769
Median expenditures ($)	600	916	240
Total expenditures (1,000)	7,302,161	6,141,821	1,160,340
Security system			
Number of projects (1,000)	3,707	2,943	764
Median expenditures ($)	350	300	400
Total expenditures (1,000)	2,194,706	1,705,733	488,973
Flooring/carpeting/paneling/ceiling tiles			
Number of projects (1,000)	12,051	7,224	4,827
Median expenditures ($)	1,674	2,300	800
Total expenditures (1,000)	32,026,087	24,970,431	7,055,656
HVAC			
Number of projects (1,000)	10,301	8,915	1,387
Median expenditures ($)	3,150	3,429	1,800
Total expenditures (1,000)	40,379,006	36,507,489	3,871,517

Septic tank			
Number of projects (1,000)	387	319	68
Median expenditures ($)	3,000	3,000	900
Total expenditures (1,000)	1,584,211	1,255,016	S
Water heater/dishwasher/garbage disposal			
Number of projects (1,000)	15,838	9,316	6,522
Median expenditures ($)	500	700	400
Total expenditures (1,000)	11,087,649	7,899,118	3,188,531
Other interior			
Number of projects (1,000)	1,661	1,192	469
Median expenditures ($)	1,200	1,500	754
Total expenditures (1,000)	4,660,744	3,947,101	713,642
Lot or Yard Additions and Replacements			
Driveways/walkways			
Number of projects (1,000)	4,099	2,712	1,387
Median expenditures ($)	1,500	2,000	500
Total expenditures (1,000)	10,744,436	9,123,787	1,620,649
Fencing/walls			
Number of projects (1,000)	4,369	2,289	2,080
Median expenditures ($)	1,000	2,000	600
Total expenditures (1,000)	9,239,951	6,722,489	2,517,462
Swimming pool/tennis court/recreational structures			
Number of projects (1,000)	806	445	361
Median expenditures ($)	4,000	7,000	800
Total expenditures (1,000)	8,864,172	7,345,981	1,518,191
Shed/detached garage/other building			
Number of projects (1,000)	2,359	1,023	1,337
Median expenditures ($)	1,500	2,500	1,000

Total expenditures (1,000)	9,333,571	5,637,621	3,695,950
Landscaping/sprinkler system			
Number of projects (1,000)	6,096	2,467	3,630
Median expenditures ($)	800	2,000	500
Total expenditures (1,000)	12,123,260	8,640,867	3,482,393
Other			
Number of projects (1,000)	829	514	315
Median expenditures ($)	1,500	2,250	S
Total expenditures (1,000)	3,429,179	2,945,964	483,215

Characteristics	Professional/Do-It-Yourself Total Estimate	Professional Estimate	Do-It-Yourself Estimate
HOME IMPROVEMENT ACTIVITY IN LAST TWO YEARS (2013)			
Total			
Number of projects (1,000)	93,558	59,411	34,147
Median expenditures ($)	1,000	2,000	500
Total expenditures (1,000)	300,831,306	246,338,538	54,492,768
Remodeling			
Kitchen			
Number of projects (1,000)	2,954	1,700	1,253
Median expenditures ($)	5,000	6,200	3,000
Total expenditures (1,000)	26,626,680	18,827,473	7,799,207
Bath			
Number of projects (1,000)	4,064	2,168	1,896
Median expenditures ($)	2,500	4,000	1,500
Total expenditures (1,000)	18,685,777	13,962,662	4,723,115
Room Additions and Renovations			
Kitchen			
Number of projects (1,000)	45	34	11
Median expenditures ($)	35,000	35,821	15,000
Total expenditures (1,000)	1,584,009	1,441,692	142,317
Bath			
Number of projects (1,000)	546	293	253
Median expenditures ($)	5,000	8,221	3,000
Total expenditures (1,000)	4,600,965	3,556,359	1,044,605

Bedroom			
Number of projects (1,000)	907	451	456
Median expenditures ($)	3,343	8,500	1,600
Total expenditures (1,000)	12,578,231	10,045,582	2,532,649
Recreation Room			
Number of projects (1,000)	320	136	184
Median expenditures ($)	5,000	6,627	3,700
Total expenditures (1,000)	2,899,929	1,581,672	1,318,257
Other			
Number of projects (1,000)	1,624	798	826
Median expenditures ($)	3,500	6,866	1,848
Total expenditures (1,000)	14,945,765	11,958,530	2,987,235
Systems and Equipment			
Plumbing/pipes			
Number of projects (1,000)	2,767	1,716	1,051
Median expenditures ($)	500	800	200
Total expenditures (1,000)	3,604,401	3,009,925	594,475
Electrical system			
Number of projects (1,000)	3,716	2,409	1,307
Median expenditures ($)	500	800	200
Total expenditures (1,000)	4,269,937	3,549,517	720,420
Plumbing fixtures			
Number of projects (1,000)	6,881	3,437	3,444
Median expenditures ($)	331	500	200
Total expenditures (1,000)	5,957,561	4,210,317	1,747,244
HVAC			
Number of projects (1,000)	7,250	6,340	910
Median expenditures ($)	3,000	3,200	1,500
Total expenditures (1,000)	26,516,143	24,496,257	2,019,885

Appliances/major equipment			
Number of projects (1,000)	14,838	9,177	5,661
Median expenditures ($)	400	500	334
Total expenditures (1,000)	8,617,672	6,333,578	2,284,094
Exterior Additions and Replacements			
Roofing			
Number of projects (1,000)	5,851	4,876	975
Median expenditures ($)	5,000	5,500	1,800
Total expenditures (1,000)	36,079,462	33,223,391	2,856,071
Siding			
Number of projects (1,000)	1,677	1,219	458
Median expenditures ($)	3,000	4,200	500
Total expenditures (1,000)	7,437,346	6,749,185	688,161
Windows/doors			
Number of projects (1,000)	6,491	4,108	2,383
Median expenditures ($)	1,100	1,800	500
Total expenditures (1,000)	16,670,157	13,622,788	3,047,369
Interior Additions and Replacements			
Insulation			
Number of projects (1,000)	2,681	1,617	1,065
Median expenditures ($)	573	955	300
Total expenditures (1,000)	3,060,617	2,498,934	561,683
Flooring/paneling/ceiling			
Number of projects (1,000)	14,241	8,534	5,706
Median expenditures ($)	1,000	1,647	500
Total expenditures (1,000)	27,522,730	21,585,632	5,937,098
Other interior			
Number of projects (1,000)	1,761	1,236	524

Median expenditures ($)	1,200	1,500	800
Total expenditures (1,000)	5,620,345	4,070,664	1,549,681
Other Additions and Replacements			
Deck/porch			
Number of projects (1,000)	489	282	207
Median expenditures ($)	3,000	5,373	1,200
Total expenditures (1,000)	2,625,615	2,236,047	389,568
Patio/terrace/detached deck			
Number of projects (1,000)	2,737	1,534	1,203
Median expenditures ($)	2,000	3,500	1,000
Total expenditures (1,000)	11,324,775	9,034,084	2,290,691
Garage			
Number of projects (1,000)	94	73	21
Median expenditures ($)	18,000	24,000	500
Total expenditures (1,000)	2,206,566	2,140,830	65,736
Carport			
Number of projects (1,000)	94	58	37
Median expenditures ($)	1,400	2,269	500
Total expenditures (1,000)	440,123	381,558	58,565
Shed			
Number of projects (1,000)	1,547	746	801
Median expenditures ($)	1,400	2,500	800
Total expenditures (1,000)	8,344,883	6,885,567	1,459,315
Swimming pool/tennis court/recreational structures			
Number of projects (1,000)	628	359	269
Median expenditures ($)	3,000	5,075	600
Total expenditures (1,000)	4,951,069	4,436,168	514,901
Other exterior			
Number of projects (1,000)	7,548	4,620	2,928

Median expenditures ($)	1,500	2,000	500
Total expenditures (1,000)	19,708,734	16,325,326	3,383,408
Disaster Repairs			
Number of projects (1,000)	1,807	1,490	316
Median expenditures ($)	7,000	7,600	2,000
Total expenditures (1,000)	23,951,815	20,174,799	3,777,017
Other interior			
Number of projects (1,000)	1,661	1,192	469
Median expenditures ($)	1,200	1,500	754
Total expenditures (1,000)	4,660,744	3,947,101	713,642
Lot or Yard Additions and Replacements			
Driveways/walkways			
Number of projects (1,000)	4,099	2,712	1,387
Median expenditures ($)	1,500	2,000	500
Total expenditures (1,000)	10,744,436	9,123,787	1,620,649
Fencing/walls			
Number of projects (1,000)	4,369	2,289	2,080
Median expenditures ($)	1,000	2,000	600
Total expenditures (1,000)	9,239,951	6,722,489	2,517,462
Swimming pool/tennis court/recreational structures			
Number of projects (1,000)	806	445	361
Median expenditures ($)	4,000	7,000	800
Total expenditures (1,000)	8,864,172	7,345,981	1,518,191
Shed/detached garage/other building			
Number of projects (1,000)	2,359	1,023	1,337
Median expenditures ($)	1,500	2,500	1,000
Total expenditures (1,000)	9,333,571	5,637,621	3,695,950

Landscaping/sprinkler system			
Number of projects (1,000)	6,096	2,467	3,630
Median expenditures ($)	800	2,000	500
Total expenditures (1,000)	12,123,260	8,640,867	3,482,393
Other			
Number of projects (1,000)	829	514	315
Median expenditures ($)	1,500	2,250	S
Total expenditures (1,000)	3,429,179	2,945,964	483,215

Characteristics	Professional/Do-It-Yourself		
	Total	Professional	Do-It-Yourself
HOME IMPROVEMENT ACTIVITY IN LAST TWO YEARS (2011)			
Total			
Number of projects (1,000)	116,263	73,015	43,248
Median expenditures ($)[1]	1,000	1,999	500
Total expenditures (1,000)	348,536,558	287,026,972	61,509,586
Remodeling[2]			
Kitchen			
Number of projects (1,000)	3,608	2,081	1,527
Median expenditures ($)[1]	5,000	7,993	3,000
Total expenditures (1,000)	34,661,061	26,886,023	7,775,039
Bath			
Number of projects (1,000)	4,825	2,503	2,323
Median expenditures ($)[1]	2,500	4,000	1,500
Total expenditures (1,000)	22,723,885	16,388,045	6,335,840
Room Additions and Renovations[2]			
Kitchen			
Number of projects (1,000)	63	52	11
Median expenditures ($)[1]	27,353	30,000	8,000
Total expenditures (1,000)	1,830,275	1,683,443	146,832
Bath			
Number of projects (1,000)	713	392	321
Median expenditures ($)[1]	3,500	5,882	2,000
Total expenditures (1,000)	4,523,881	3,460,385	1,063,497
Bedroom			

Number of projects (1,000)	1,142	506	636
Median expenditures ($)[1]	2,500	5,000	1,500
Total expenditures (1,000)	8,537,461	5,954,937	2,582,524
Recreation Room			
Number of projects (1,000)	490	202	288
Median expenditures ($)[1]	3,000	6,882	1,600
Total expenditures (1,000)	3,486,584	2,662,713	823,871
Other			
Number of projects (1,000)	1,978	997	981
Median expenditures ($)[1]	3,000	5,000	1,500
Total expenditures (1,000)	16,627,399	13,298,699	3,328,700
Systems and Equipment[2]			
Plumbing/pipes			
Number of projects (1,000)	3,312	2,082	1,231
Median expenditures ($)[1]	500	900	180
Total expenditures (1,000)	4,506,681	3,955,534	551,146
Electrical system			
Number of projects (1,000)	4,434	2,864	1,569
Median expenditures ($)[1]	500	800	200
Total expenditures (1,000)	4,976,258	4,231,366	744,892
Plumbing fixtures			
Number of projects (1,000)	7,944	3,811	4,133
Median expenditures ($)[1]	305	500	200
Total expenditures (1,000)	6,207,328	4,125,458	2,081,870
HVAC			
Number of projects (1,000)	9,574	8,365	1,209
Median expenditures ($)[1]	3,000	3,176	1,500
Total expenditures (1,000)	33,214,557	30,498,058	2,716,499
Appliances/major equipment			

Number of projects (1,000)	17,913	11,276	6,637
Median expenditures ($)[1]	400	500	320
Total expenditures (1,000)	10,213,056	7,588,909	2,624,147
Exterior Additions and Replacements[2]			
Roofing			
Number of projects (1,000)	7,269	5,950	1,319
Median expenditures ($)[1]	4,800	5,276	1,807
Total expenditures (1,000)	42,534,922	38,896,570	3,638,351
Siding			
Number of projects (1,000)	2,154	1,444	710
Median expenditures ($)[1]	3,000	4,500	762
Total expenditures (1,000)	10,342,508	8,965,278	1,377,230
Windows/doors			
Number of projects (1,000)	8,676	5,629	3,047
Median expenditures ($)[1]	1,282	2,000	500
Total expenditures (1,000)	23,145,692	19,648,147	3,497,546
Interior Additions and Replacements[2]			
Insulation			
Number of projects (1,000)	4,085	2,116	1,970
Median expenditures ($)[1]	500	1,000	300
Total expenditures (1,000)	4,287,875	3,214,117	1,073,757
Flooring/paneling/ceiling			
Number of projects (1,000)	18,320	10,907	7,413
Median expenditures ($)[1]	1,000	1,510	500
Total expenditures (1,000)	31,910,709	25,087,900	6,822,809
Other interior			
Number of projects (1,000)	1,780	1,218	561
Median expenditures ($)[1]	1,000	1,500	500

Total expenditures (1,000)	4,129,829	3,416,024	713,805
Other Additions and Replacements[2]			
Deck/porch			
Number of projects (1,000)	505	287	217
Median expenditures ($)[1]	2,000	3,000	1,342
Total expenditures (1,000)	2,701,309	2,290,101	411,208
Patio/terrace/detached deck			
Number of projects (1,000)	3,500	1,835	1,665
Median expenditures ($)[1]	2,000	3,176	1,000
Total expenditures (1,000)	13,022,905	9,963,322	3,059,583
Garage			
Number of projects (1,000)	158	87	71
Median expenditures ($)[1]	15,000	20,250	5,000
Total expenditures (1,000)	2,621,310	2,165,996	455,314
Carport			
Number of projects (1,000)	158	82	76
Median expenditures ($)[1]	1,500	1,600	1,300
Total expenditures (1,000)	399,581	240,654	158,927
Shed			
Number of projects (1,000)	2,098	977	1,121
Median expenditures ($)[1]	1,429	2,600	800
Total expenditures (1,000)	8,599,423	5,927,181	2,672,242
Swimming pool/tennis court/recreational structures			
Number of projects (1,000)	713	414	300
Median expenditures ($)[1]	2,500	6,000	500
Total expenditures (1,000)	7,417,915	7,102,007	315,908
Other exterior			
Number of projects (1,000)	9,003	5,419	3,584
Median expenditures ($)[1]	1,247	2,000	500

Total expenditures (1,000)	22,898,421	18,263,708	4,634,713
Disaster Repairs			
Number of projects (1,000)	1,846	1,519	327
Median expenditures ($)	7,000	8,000	2,736
Total expenditures (1,000)	23,015,733	21,112,396	1,903,337
Other interior			
Number of projects (1,000)	1,661	1,192	469
Median expenditures ($)	1,200	1,500	754
Total expenditures (1,000)	4,660,744	3,947,101	713,642
Lot or Yard Additions & Replacements			
Driveways/walkways			
Number of projects (1,000)	4,099	2,712	1,387
Median expenditures ($)	1,500	2,000	500
Total expenditures (1,000)	10,744,436	9,123,787	1,620,649
Fencing/walls			
Number of projects (1,000)	4,369	2,289	2,080
Median expenditures ($)	1,000	2,000	600
Total expenditures (1,000)	9,239,951	6,722,489	2,517,462
Swimming pool/tennis court/recreational structures			
Number of projects (1,000)	806	445	361
Median expenditures ($)	4,000	7,000	800
Total expenditures (1,000)	8,864,172	7,345,981	1,518,191
Shed/detached garage/other building			
Number of projects (1,000)	2,359	1,023	1,337
Median expenditures ($)	1,500	2,500	1,000
Total expenditures (1,000)	9,333,571	5,637,621	3,695,950
Landscaping/sprinkler system			
Number of projects (1,000)	6,096	2,467	3,630

Median expenditures ($)	800	2,000	500
Total expenditures (1,000)	12,123,260	8,640,867	3,482,393
Other			
Number of projects (1,000)	829	514	315
Median expenditures ($)	1,500	2,250	S
Total expenditures (1,000)	3,429,179	2,945,964	483,215

Annex B - CDC Injury Data

2001 - 2017, United States
Fall Deaths and Rates per 100,000

All Races, Both Sexes, All Ages

ICD-10 Codes: W00-W19,X80,Y01,Y30

Number of Deaths	Population***	Crude Rate	Age-Adjusted Rate**
443,576	5,200,918,231	8.53	7.93

Reports for All Ages include those of unknown age.

* Rates based on 20 or fewer deaths may be unstable. Use with caution.

** Standard Population is 2000, all races, both sexes.

*** Population estimates are aggregated for multi-year reports to produce rates.

Produced by: National Center for Injury Prevention and Control, CDC
Data Source: NCHS Vital Statistics System for numbers of deaths. Bureau of Census for population estimates.

10 Leading Causes of Nonfatal Unintentional Emergency Department Visits, United States

2001 - 2017, All Races, Both Sexes, Disposition: All Cases

	Age Groups										
Rank	<1	1-4	5-9	10-14	15-24	25-34	35-44	45-54	55-64	65+	All Ages
1	Unintentional Fall 2,203,241	Unintentional Fall 14,695,505	Unintentional Fall 10,895,788	Unintentional Fall 10,193,254	Unintentional Struck by/ Against 16,379,505	Unintentional Fall 12,925,580	Unintentional Fall 12,965,891	Unintentional Fall 14,643,385	Unintentional Fall 13,392,906	Unintentional Fall 38,484,766	Unintentional Fall 144,895,252
2	Unintentional Struck by/ Against 533,293	Unintentional Struck by/ Against 6,058,063	Unintentional Struck by/ Against 6,868,690	Unintentional Struck by/ Against 9,721,402	Unintentional Fall 14,486,086	Unintentional Overexertion 11,152,537	Unintentional Overexertion 9,867,239	Unintentional Overexertion 7,534,235	Unintentional Struck by/ Against 4,040,364	Unintentional Struck by/ Against 4,271,311	Unintentional Struck by/ Against 74,260,233
3	Unintentional Other Bite/ Sting 211,421	Unintentional Other Bite/ Sting 2,496,959	Unintentional Cut/Pierce 1,921,531	Unintentional Overexertion 4,798,474	Unintentional MV-Occupant 12,889,729	Unintentional Struck by/ Against 10,688,727	Unintentional Struck by/ Against 8,646,276	Unintentional Struck by/ Against 6,849,399	Unintentional Overexertion 3,954,803	Unintentional Overexertion 3,338,390	Unintentional Overexertion 55,470,069
4	Unintentional Foreign Body 168,685	Unintentional Foreign Body 2,115,187	Unintentional Other Bite/ Sting 1,684,445	Unintentional Cut/Pierce 2,290,666	Unintentional Overexertion 12,057,868	Unintentional MV-Occupant 9,764,377	Unintentional MV-Occupant 7,404,124	Unintentional MV-Occupant 6,008,660	Unintentional MV-Occupant 3,674,071	Unintentional MV-Occupant 3,274,416	Unintentional MV-Occupant 46,257,031
5	Unintentional Fire/Burn 166,348	Unintentional Cut/Pierce 1,416,767	Unintentional Pedal Cyclist 1,438,614	Unintentional Pedal Cyclist 1,809,487	Unintentional Cut/Pierce 7,710,641	Unintentional Cut/Pierce 7,154,265	Unintentional Cut/Pierce 5,711,252	Unintentional Cut/Pierce 4,715,968	Unintentional Cut/Pierce 2,910,149	Unintentional Cut/Pierce 2,329,593	Unintentional Cut/Pierce 36,268,894
6	Unintentional Other Specified 134,502	Unintentional Overexertion 1,315,913	Unintentional Overexertion 1,354,807	Unintentional Unknown/ Unspecified 1,628,755	Unintentional Other Specified 4,030,764	Unintentional Other Specified 4,205,722	Unintentional Other Specified 4,087,399	Unintentional Other Specified 4,369,757	Unintentional Other Specified 2,336,522	Unintentional Other Bite/ Sting 1,433,760	Unintentional Other Specified 21,953,757
7	Unintentional Inhalation/ Suffocation 117,464	Unintentional Other Specified 932,167	Unintentional MV-Occupant 1,089,855	Unintentional MV-Occupant 1,437,342	Unintentional Other Bite/ Sting 2,956,648	Unintentional Other Bite/ Sting 2,807,584	Unintentional Poisoning 2,848,707	Unintentional Poisoning 3,189,281	Unintentional Poisoning 1,858,449	Unintentional Poisoning 1,409,344	Unintentional Other Bite/ Sting 18,634,091
8	Unintentional Cut/Pierce 106,012	Unintentional Fire/Burn 903,828	Unintentional Foreign Body 982,591	Unintentional Other Bite/ Sting 1,067,652	Unintentional Unknown/ Unspecified 2,697,889	Unintentional Poisoning 2,717,196	Unintentional Other Bite/ Sting 2,357,389	Unintentional Other Bite/ Sting 2,183,425	Unintentional Other Bite/ Sting 1,434,421	Unintentional Other Specified 1,124,089	Unintentional Poisoning 15,608,986
9	Unintentional Overexertion 94,101	Unintentional Poisoning 757,380	Unintentional Dog Bite 751,546	Unintentional Other Transport 903,792	Unintentional Poisoning 2,398,193	Unintentional Unknown/ Unspecified 1,865,642	Unintentional Unknown/ Unspecified 1,532,981	Unintentional Unknown/ Unspecified 1,303,370	Unintentional Unknown/ Unspecified 799,484	Unintentional Other Transport 1,096,837	Unintentional Unknown/ Unspecified 12,386,141
10	Unintentional Unknown/ Unspecified 90,681	Unintentional Unknown/ Unspecified 752,229	Unintentional Other Transport 689,682	Unintentional Dog Bite 598,757	Unintentional Other Transport 2,006,159	Unintentional Other Transport 1,563,933	Unintentional Other Transport 1,316,897	Unintentional Other Transport 1,149,322	Unintentional Other Transport 753,041	Unintentional Unknown/ Unspecified 1,054,400	Unintentional Foreign Body 9,979,708

National Center for Injury Prevention and Control, CDC

NEISS All Injury Program operated by the Consumer Product Safety Commission (CPSC).

Public Comment No. 314-NFPA 70-2021 [Section No. 210.13]

210.13 Ground-Fault Protection of Equipment.

Each branch-circuit 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 requirements on 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 branch circuit and on the load side of any transformer supplying the branch circuit.

Exception No. 3: For fused disconnects, where the available fault current 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. 4: For circuit breakers, where the available fault current 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.

Statement of Problem and Substantiation for Public Comment

A sincere “Thank You” goes to Code Making Panels 2 and 10 for discovering the flaw with Public Inputs 693, 694, 695, and 696. The Panels stated: “Substantiation was not provided to support the equivalency of alternate technologies. As an example, it is possible that alternate systems 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.” To rectify this flaw, this Public Comment has added the requirement that the methods to reduce clearing time operate at the lower of the calculated minimum arcing current or 38% of the available fault current. While an arcing fault from phase to ground is almost certainly going to escalate into a three phase arcing fault, it is possible that the arcing fault could remain as a phase to ground arcing fault. When this occurs, it has been shown, in numerous IEEE papers, that the minimum phase to ground arcing fault, on a 480/277 volt, solidly grounded system, must be at least 38% of the available fault current in order to sustain the arc. With this requirement added in, it is assured that the method to reduce clearing time will function to clear the circuit.

In addition to this requirement, and to add even more conservatism, this Public Comment has added a minimum available fault current of 10,000 amperes to the proposed requirement. Based on a 32mm spacing, 480 volts, and HCB configuration, IEEE 1584-2018 calculates the minimum arcing current to be 6.09 kA for an available (bolted) fault current of 10,000 amperes. The minimum arcing current of 6.09 KA is 5 times the maximum 1200 ampere setting and 2 times the 3000 ampere value used with the one second maximum delay. (NEC 230.95(A) allows for a maximum setting of 1200 amperes and a maximum time delay of 1 second at 3000 amperes or greater.) The 6.09 KA current for 60 cycles produces an expected equipment damage level of 36,540 KW-Cycles (6.09KA X 100 arcing volts X 60 cycles). In contrast, this Public Comment would provide a worst case, expected equipment damage level of only 4,263 KW-Cycles. Yes, that is correct, the proposed exception would allow less than 12% of the damage level allowed by the existing 230.95(A) requirements.

The following paragraphs provide a detailed comparison of expected equipment damage levels allowed by 230.95(A), proposed exceptions for fusible switches (240.67), and proposed exceptions for circuit breakers (240.87).

Expected Equipment Damage from 230.95(A)

For a 32mm spacing, 480 volts, and HCB configuration, and an available fault current of 10kA, the IEEE 1584-2018 arcing current is 7.07kA with a minimum arcing current of 6.09kA. Using the maximum 230.95(A) opening time of 60 cycles, the expected equipment damage is 36,540 kW-cycles.

For a 32mm spacing, 480 volts, and HCB configuration, and an available fault current of 25kA, the IEEE 1584-2018 arcing current is 17.64kA with a minimum arcing current of 15.21kA. Using the maximum 230.95(A) opening time of 60 cycles, the expected equipment damage is 91,260 kW-cycles.

For a 32mm spacing, 480 volts, and HCB configuration, and an available fault current of 50kA, the IEEE 1584-2018 arcing current is 30.14kA with a minimum arcing current of 25.98kA. Using the maximum 230.95(A) opening time of 60 cycles, the expected equipment damage is 155,880 kW-cycles.

Expected Equipment Damage from Proposed Exceptions for Fusible Switches (240.67)

For a 32mm spacing, 480 volts, and HCB configuration, and an available fault current of 10kA, the IEEE 1584-2018 arcing current is 7.07kA with a minimum arcing current of 6.09kA. Assuming an opening time of 4 cycles for 240.67(B), the expected equipment damage is 2,436 kW-cycles. Assuming an opening time of 7 cycles for 240.67(B)(1) or (B)(3), the expected equipment damage is 4,263 kW-cycles. Assuming an opening time of 1/2 cycle for 240.67(B)(4), the expected equipment damage is 305 kW-cycles. Worst case damage (4,263 kW-cycles) is less than 12% of the damage allowed by 230.95(A) (36,540 kW-cycles).

For a 32mm spacing, 480 volts, and HCB configuration, and an available fault current of 25kA, the IEEE 1584-2018 arcing current is 17.64kA with a minimum arcing current of 15.21kA. Assuming an opening time of 4 cycles for 240.67(B), the expected equipment damage is 6,084 kW-cycles. Assuming an opening time of 7 cycles for 240.67(B)(1) or (B)(3), the expected equipment damage is 10,647 kW-cycles. Assuming an opening time of 1/2 cycle for 240.67(B)(4), the expected equipment damage is 761 kW-cycles. Worst case damage (10,647 kW-cycles) is less than 12% of the damage allowed by 230.95(A) (91,260 kW-cycles).

For a 32mm spacing, 480 volts, and HCB configuration, and an available fault current of 50kA, the IEEE 1584-2018 arcing current is 30.14kA with a minimum arcing current of 25.98kA. Assuming an opening time of 4 cycles for 240.67(B), the expected equipment damage is 10,392 kW-cycles. Assuming an opening time of 7 cycles for 240.67(B)(1) or (B)(3), the expected equipment damage is 18,186 kW-cycles. Assuming an opening time of 1/2 cycle for 240.67(B)(4), the expected equipment damage is 1,299 kW-cycles. Worst case damage (18,186 kW-cycles) is less than 12% of the damage allowed by 230.95(A) (155,880 kW-cycles)

Expected Equipment Damage from Proposed Exceptions for Circuit Breakers (240.87)

For a 32mm spacing, 480 volts, and HCB configuration, and an available fault current of 10kA, the IEEE 1584-2018 arcing current is 7.07kA with a minimum arcing current of 6.09kA. Assuming an opening time of 4 cycles for 240.87(B)(1), (B)(2), or (B)(4), the expected equipment damage is 2,436 kW-cycles. Assuming an opening time of 3 cycles for 240.87(B)(5) or (B)(6), the expected equipment damage is 1,827 kW-cycles. Worst case damage (2,426 KW-Cycles) is less than 7% of the damage allowed by 230.95(A) (36,540 kW-cycles).

For a 32mm spacing, 480 volts, and HCB configuration, and an available fault current of 25kA, the IEEE 1584-2018 arcing current is 17.64kA with a minimum arcing current of 15.21kA. Assuming an opening time of 4 cycles for 240.87(B)(1), (B)(2), or (B)(4), the expected equipment damage is 6,084 kW-cycles. Assuming an opening time of 3 cycles for 240.87(B)(5) or (B)(6), the expected equipment damage is 4,563 kW-cycles. Worst case damage (6,084 kW-Cycles) is less than 7% of the damage allowed by 230.95(A) (91,260 kW-cycles).

For a 32mm spacing, 480 volts, and HCB configuration, and an available fault current of 50kA, the IEEE 1584-2018 arcing current is 30.14kA with a minimum arcing current of 25.98kA. Assuming an opening time of 4 cycles for 240.87(B)(1), (B)(2), or (B)(4), the expected equipment damage is 10,392 kW-cycles. Assuming an opening time of 3 cycles for 240.87(B)(5) or (B)(6), the expected equipment damage is 7,794 kW-cycles. Worst case damage (10,392 KW-Cycles) is less than 7% of the damage allowed by 230.95(A) (155,880 kW-cycles).

Other Change from Public Input Stage

The other change that is made from the original Public Input is that the text lists the methods that can be used rather than the methods that cannot be used.

Background from Public Input Stage

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 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 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 damage to the switchboard, switchgear, panelboard or equipment, not the downstream conductors or busway.

The electrical industry has evolved considerably since those early GFPE requirements were introduced. IEEE 1584 now predicts the magnitude of the arcing current along with the incident energy to which a worker could be exposed while working on energized equipment. It has become clearly evident that the level of protection necessary to protect an employee is orders of magnitude greater than that required to protect equipment.

Energy reducing maintenance switches (240.67(B)(2) and 240.87(B)(3)) are excluded 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 unknown at this time.

Key Benefit

One very key benefit of this Public Comment is that when these alternate methods are utilized, it provides the consulting engineer with significantly more design options to meet the selective coordination requirements of 700.32, 701.32, and 708.54. This becomes especially important now, because it appears that GFPE will be required at 800 amperes and above, rather than 1000 amperes and above, making selective coordination even more challenging for the consulting engineer.

Conclusion

This Public Comment 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. The methods to reduce clearing time will limit the arcing fault damage to the equipment to a level that is considerably less than currently allowed by the requirements found in 230.95(A).

Related Item

• PI 694

Submitter Information Verification

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Submittal Date:	Tue Jul 20 20:48:42 EDT 2021
Committee:	NEC-P02

Public Comment No. 753-NFPA 70-2021 [New Section after 210.15]

TITLE OF NEW CONTENT

210.16 Branch Circuits for Medical Electrical Equipment (MEE)

In dwelling units, dormitories, and residential board-and-care occupancies, all 120-volt through 250-volt, single-phase, 15-, 20- and 30-ampere branch circuits

supplying or designated to supply receptacle outlets for cord-and-plug-connected MEE shall comply with all of the following requirements:

(1) The cumulative ratings of cord-and-plug-connected MEE shall not exceed 50 percent of the branch-circuit ampere rating.

(2) Where MEE or the receptacle supplying MEE, or both, does not incorporate an integral alarm to indicate a loss of power, an

alarm device capable of notifying the intended user or attendant shall be installed to monitor electrical power continuity.

(3) Each receptacle outlet connected to branch circuits supplying or intended to supply receptacle outlets for cord-and-plug-connected MEE shall be

labeled to comply with all of the following:

a. The warning label or sign shall not be handwritten and shall comply with 110.21(B)(1) and (B)(3).

b. The warning label or sign shall be located within 450 mm (18 in) of each receptacle outlet of the branch circuit. Where the receptacle outlet

consists of a fixed multioutlet assembly, each receptacle outlet shall be determined in accordance with 220.14(H)(1) or (H)(2). Where the

accessible receptacle outlet consists of a pendant receptacle, a label or affixed tag located within 450 mm (18 in) of the cord connector shall

be permitted to provide the warning. Where a receptacle outlet is not readily accessible and MEE is connected by means of a relocatable power tap or a furniture power distribution unit, an additional label or affixed tag located within 450 mm (18 in) of the cord

connector or output shall provide the warning.

c. The warning label, sign or affixed tag shall state the following or equivalent words:

WARNING — Power Loss Risk to

Life-Support and Medical Equipment on same circuit.

DO NOT OVERLOAD

Informational Note No. 1: MEE includes but is not limited to electrically-operated beds, ventilators, intravenous fluid therapy dispensers, and personal

status monitors. See Annex K for additional information.

Informational Note No. 2 to (1): See 210.23(A)(2) for application of the circuit loading limitation.

Statement of Problem and Substantiation for Public Comment

It seems that the part of the PI that would be most difficult to enforce is the limit on the cumulative load of DME, which may not have been determined certainly at the time of the wiring, or may change. Nevertheless, it seems far better to set expectations than to offer no guidance specific to this issue. One element of Mr. Lottmann's PI that troubles me, in addition to certain language use, is the presumption that extension cords may be used, as I understand that they are investigated for temporary use only. If all DME is designed so it can be plugged in directly to a receptacle, I would delete this portion. In addition, in keeping with NFPA 72's approach, I would not limit alarms to audible or even putatively audible ones.

Related Item

• PI 3605

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Committee:	NEC-P02

Public Comment No. 634-NFPA 70-2021 [Section No. 210.15]

210.15 Reconditioned Equipment.

Reconditioned equipment shall be listed as "reconditioned" and the original listing mark removed. The following shall not be reconditioned:

(1) Equipment that provides ground-fault circuit-interrupter protection for personnel

(2) Equipment that provides arc-fault circuit-interrupter protection

Additional Proposed Changes

File Name	Description	Approved
2_CN_239.pdf	2 CN239	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 239 appeared in the First Draft Report on First Revision No. 9095.

The Correlating Committee directs the panel to reconsider the text in the opening sentence to remove redundant requirements in accordance with 4.1.1 of the NEC Style Manual and correlate with FR 8577.

Related Item

• First Revision No. 9095

Submitter Information Verification

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Submittal Date: Mon Aug 02 15:55:29 EDT 2021

Committee: NEC-P02

Correlating Committee Note No. 239-NFPA 70-2021 [Section No. 210.15]

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Thu May 06 09:12:00 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs the panel to reconsider the text in the opening sentence to remove redundant requirements in accordance with 4.1.1 of the NEC Style Manual and correlate with FR 8577.

First Revision No. 9095-NFPA 70-2021 [Section No. 210.15]

Ballot Results

✔ **This item has passed ballot**

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

Affirmative All

Ayer, Lawrence S.

Gallo, Ernest J.

Hickman, Palmer L.

Holub, Richard A.

Hunter, Dean C.

Johnston, Michael J.

Kendall, David H.

Kovacik, John R.

Manche, Alan

McDaniel, Roger D.

Porter, Christine T.

Williams, David A.

Public Comment No. 22-NFPA 70-2021 [Section No. 210.18]

210.18 Rating.

Branch circuits recognized by this article shall be rated in accordance with the maximum permitted ampere rating or setting of the overcurrent device. The rating for other than individual branch circuits shall be 10, 15, 20, 30, 40, and 50 amperes. Where conductors of higher ampacity are used for any reason, the ampere rating or setting of the specified overcurrent device shall determine the circuit rating.

~~Exception No. 1~~

Branch circuits rated 10 amperes shall not be permitted to supply receptacle outlets.

Exception : Multioutlet branch circuits greater than 50 amperes shall be permitted to supply nonlighting outlet loads in locations where conditions of maintenance and supervision ensure that only qualified persons service the equipment.

~~Exception No. 2: Branch circuits rated 10 amperes shall not be permitted to supply receptacle outlets.~~

Statement of Problem and Substantiation for Public Comment

Exception No. 2 was added in the first revisions. This addition is a requirement, the wording "…shall not be…" is used, which is, by definition 3.1.1 of the style manual, a mandatory rule. Adding the term "permitted" to the end of the phrase does not eliminate the mandatory nature of this rule. Since the language of Exception 2 is a mandatory rule, it does not "…covey alternatives or differences to…" the "…"basic rule…" as required by 3.1.4 of the style manual.

The text of Exception No. 2 has been moved to the main text of the section to comply with the style manual.

Related Item

• FR 9097-NFPA 70-2021

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Committee: NEC-P02

Public Comment No. 1302-NFPA 70-2021 [Section No. 210.19]

210.19 Conductors — Minimum Ampacity and Size.

Branch circuit conductors for circuits not ~~more than~~ exceeding 1000 volts shall be sized in accordance with 210.19(A) through (D).

Informational Note: Conductors for branch circuits 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, provide reasonable efficiency of operation. See Informational Note No. 2 of 215.2(A)(1) for voltage drop on feeder conductors.

(A) General.

Branch-circuit conductors shall have an ampacity not less than the larger of the following and comply with 110.14(C) for equipment terminations:

(1) Where a branch circuit supplies continuous loads or any combination of continuous and noncontinuous loads, the minimum branch-circuit conductor size shall have an ampacity not less than the noncontinuous load plus 125 percent of the continuous load in accordance with 310.14.

Exception to (1): If the assembly, including the overcurrent devices protecting the branch circuits, is listed for operation at 100 percent of its rating, the ampacity of the branch-circuit conductors shall be permitted to be not less than the sum of the continuous load plus the noncontinuous load in accordance with 110.14(C).

(2) The minimum branch-circuit 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 310.15.

Exception to (1) and (2): Where a portion of a branch circuit is connected at both its supply and load ends to separately installed pressure connections as covered in 110.14(C)(2), an allowable ampacity in accordance with 310.15 not less than the sum of the continuous load plus the noncontinuous load shall be permitted. No portion of a branch circuit installed under this exception shall extend into an enclosure containing either the branch-circuit supply or the branch-circuit load terminations.

(B) Branch Circuits with More than One Receptacle.

Conductors of branch circuits supplying more than one receptacle for cord-and-plug-connected portable loads shall have an ampacity of not less than the rating of the branch circuit.

(C) Household Ranges and Cooking Appliances.

Branch-circuit conductors supplying household ranges, wall-mounted ovens, counter-mounted cooking units, and other household cooking appliances shall have an ampacity not less than the rating of the branch circuit and not less than the maximum load to be served. For ranges of 8¾ kW or more rating, the minimum branch-circuit rating shall be 40 amperes.

Exception No. 1: Conductors tapped from a branch circuit not exceeding 50 amperes supplying electric ranges, wall-mounted electric ovens, and counter-mounted electric cooking units shall have an ampacity of not less than 20 amperes and shall be sufficient for the load to be served. These tap conductors include any conductors that are a part of the leads supplied with the appliance that are smaller than the branch-circuit conductors. The taps shall not be longer than necessary for servicing the appliance.

Exception No. 2: The neutral conductor of a 3-wire branch circuit supplying a household electric range, a wall-mounted oven, or a counter-mounted cooking unit shall be permitted to be smaller than the ungrounded conductors where the maximum demand of a range of 8¾ kW or more rating has been calculated according to Column C of Table 220.55, but such conductor shall have an ampacity of not less than 70 percent of the branch-circuit rating and shall not be smaller than 10 AWG.

(D) Other Loads.

Branch-circuit conductors that supply loads other than those specified in 210.3 and other than cooking appliances as covered in 210.19(C) shall have an ampacity sufficient for the loads served and shall not be smaller than 14 AWG.

Exception No. 1: Tap conductors shall have an ampacity sufficient for the load served. In addition, they shall have an ampacity of not less than 15 for circuits rated less than 40 amperes and not less than 20 for circuits rated at 40 or 50 amperes and only where these tap conductors supply any of the following loads:

(1) Individual lampholders or luminaires with taps extending not longer than 450 mm (18 in.) beyond any portion of the lampholder or luminaire

(2) A luminaire having tap conductors in accordance with 410.117

(3) Individual outlets, other than receptacle outlets, with taps not over 450 mm (18 in.) long

(4) Infrared lamp industrial heating appliances

(5) Nonheating leads of deicing and snow-melting cables and mats

Exception No. 2: Fixture wires and flexible cords shall be permitted to be smaller than 14 AWG as permitted by 240.5.

Statement of Problem and Substantiation for Public Comment

I think the the 1,000V cutoff is intended to apply to the circuit, not the conductor's insulation rating.

Related Item

• FR 9298

Submitter Information Verification

Submitter Full Name:	Ryan Jackson
Organization:	Ryan Jackson
Street Address:	
City:	
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Zip:	
Submittal Date:	Wed Aug 11 16:34:27 EDT 2021
Committee:	NEC-P02

Public Comment No. 1482-NFPA 70-2021 [Section No. 210.19(A)]

(A) General.

Branch-~~circuit conductors shall have an ampacity not~~ circuits shall have a minimum conductor size not less than the larger of ~~the following and~~ 210.19(A)(1) or 210.19(A)(2) and shall comply with 110.14(C) ~~for equipment terminations: Where a branch circuit supplies continuous loads or any combination of continuous and noncontinuous loads, the minimum branch-circuit conductor size shall have an ampacity~~ .

(1) A conductor size based on its table ampacity not less than the noncontinuous load plus 125 percent of the continuous load in accordance with 310.14 .

Exception to (1): If the assembly, including the overcurrent devices protecting the branch circuits, is listed for operation at 100 percent of its rating, the ampacity of the branch-circuit conductors shall be permitted to be not less than the sum of the continuous load plus the noncontinuous load in accordance with 110.14(C) .

(2) ~~The minimum branch-circuit~~ A conductor size ~~shall have an ampacity~~ based on its modified ampacity not less than the maximum load to be served after the application of any adjustment or correction factors in accordance with 310.15 .

Exception to (1) and (2): Where a portion of a branch circuit is connected at both its supply and load ends to separately installed pressure connections as covered in 110.14(C)(2), an allowable ampacity in accordance with 310.15 not less than the sum of the continuous load plus the noncontinuous load shall be permitted. No portion of a branch circuit installed under this exception shall extend into an enclosure containing either the branch-circuit supply or the branch-circuit load terminations.

Statement of Problem and Substantiation for Public Comment

The way the rule is currently written is not clear. The intent of this rule is understood to be about the minimum size of a branch-circuit conductor, yet it conflates the meaning of the physical size of a conductor with its ampacity. The proposed change attempts to clarify the following:

1. Affirms the requirement is primarily about the minimum conductor size (namely the minimum AWG or kcmil),
2. Establishes a difference between the allowable ampacity (which is only a table ampacity) and the modified ampacity (which reflects any correction/adjustment factors based on the conditions of use),
3. Maintains the original intent in a clear concise manner while doing away with ambiguous language and improving readability,
4. Supports consistency with the verbiage and intent of Section 215.2(A)(1)

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 1481-NFPA 70-2021 [Section No. 215.2(A)(1)]	Similar Requirement
Public Comment No. 1481-NFPA 70-2021 [Section No. 215.2(A)(1)]	

Related Item

- Public Input No. 2013-NFPA 70-2020

Submitter Information Verification

Submitter Full Name: Octavio L Gonzalez

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Submittal Date: Sat Aug 14 15:48:36 EDT 2021

Committee: NEC-P02

Public Comment No. 60-NFPA 70-2021 [Section No. 210.19(A)]

(A) General.

Branch-circuit conductors shall have an ampacity not less than the larger of the following and comply with 110.14(C) for equipment terminations:

(1) Where a branch circuit supplies continuous loads or any combination of continuous and noncontinuous loads, the minimum branch-circuit conductor size shall have an ampacity not less than the noncontinuous load plus 125 percent of the continuous load, before the application of any adjustment or correction factors in accordance with 310. ~~14~~ 15(B) or (C) .

Exception to (1): If the assembly, including the overcurrent devices protecting the branch circuits, is listed for operation at 100 percent of its rating, the ampacity of the branch-circuit conductors shall be permitted to be not less than the sum of the continuous load plus the noncontinuous load, before the application of any adjustment or correction factors in accordance with ~~110~~ 310 . ~~14~~ 15 (B) or (C) .

(2) The minimum branch-circuit 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 310.15.

Exception to (1) and (2): Where a portion of a branch circuit is connected at both its supply and load ends to separately installed pressure connections as covered in 110.14(C)(2), an allowable ampacity in accordance with 310.15 not less than the sum of the continuous load plus the noncontinuous load shall be permitted. No portion of a branch circuit installed under this exception shall extend into an enclosure containing either the branch-circuit supply or the branch-circuit load terminations.

Statement of Problem and Substantiation for Public Comment

As currently written, the 210.19(A)(1) phrases "ampacity . . . in accordance with 310.14" in part (a) and "ampacity . . . after the application of any adjustment or correction factors in accordance with 310.15" in part (b) have the identical meaning and value. The article 100 definition of "ampacity" refers to the "conditions of use". That means whenever the word "ampacity" is used in the NEC without any modifiers, it refers to a value that includes the "adjustment or correction factors in accordance with 310.15." The reference to 310.14 in part (a) does not change that. The result is that logically, as currently written, part (b) is moot; the value in part (a) will always be larger.

My understanding is that this is not the intention, that the computation in part (a) is meant to be based not on the final "ampacity", but rather the ampacity before the the application of any adjustment or correction factors. That is the value directly from the tables in 310.16 through 310.21. But if the CMP's preference is not to directly reference those tables as suggested in the related PI, the language I proposed for this Public Comment would be a good alternative.

Regardless, 210.19(A)(1)(a) must be amended to refer to something other than simply "ampacity," as the current text's meaning does not match the intended meaning.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 59-NFPA 70-2021 [Section No. 215.2(A)(1)]	

Related Item

• Public Input No. 2013-NFPA 70-2020

Submitter Information Verification

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Committee: NEC-P02

Public Comment No. 284-NFPA 70-2021 [Section No. 210.19 [Excluding any Sub-Sections]]

Branch circuit conductors not more than 1000 volts ac or 1500 volts dc shall be sized in accordance with 210.19(A) through (D).

Informational Note: Conductors for branch circuits 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, provide reasonable efficiency of operation. See Informational Note No. 2 of 215.2(A)(1) for voltage drop on feeder conductors.

Statement of Problem and Substantiation for Public Comment

This public comment is submitted on behalf of a correlating committee CMP 2 task group formulated to create a new Article 235 to cover requirements for branch circuits over 1000 Vac and 15000 Vdc. This task group consists of the following members: Thomas Domitrovich, Paul Barnhart, David Williams, Alan Manche, Mike Querry, Kevin Rogers, Roger McDaniel, Rod Belisle. This comment adds both 1000 Vac and 1500 Vdc to ensure alignment with the scope of Article 235

Related Item

- FR 9298

Submitter Information Verification

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Submittal Date: Mon Jul 19 19:04:03 EDT 2021
Committee: NEC-P02

Public Comment No. 1303-NFPA 70-2021 [Section No. 210.20]

210.20 Overcurrent Protection.

Branch-circuit conductors and equipment for circuits not exceeding 1,000V shall be protected by overcurrent protective devices that have a rating or setting that complies with 210.20(A) through (D).

(A) Continuous and Noncontinuous Loads.

Where a branch circuit 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 branch circuit(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.

(B) Conductor Protection.

Conductors shall be protected in accordance with 240.4. Flexible cords and fixture wires shall be protected in accordance with 240.5.

(C) Equipment.

The rating or setting of the overcurrent protective device shall not exceed that specified in the applicable articles referenced in Table 240.3 for equipment.

(D) Outlet Devices.

The rating or setting shall not exceed that specified in 210.21 for outlet devices.

Statement of Problem and Substantiation for Public Comment

Correlation with 210.19, if Article 235 is created.

Related Item

- FR 9298

Submitter Information Verification

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Submittal Date: Wed Aug 11 16:37:48 EDT 2021
Committee: NEC-P02

Public Comment No. 1803-NFPA 70-2021 [Section No. 210.21(B)(3)]

(3) Receptacle Ratings.

Where connected to a branch circuit supplying two or more receptacles or outlets, receptacle ratings shall not be less than the values listed in Table 210.21(B)(3), or, where rated higher than 50 amperes, the receptacle rating shall not be less than the branch-circuit rating.

Exception No. 1: Receptacles installed exclusively for the use of cord-and-plug-connected arc welders shall be permitted to have ampere ratings not less than the minimum branch-circuit conductor ampacity determined by 630.11(A) or (B) for arc welders.

Exception No. 2: The ampere rating of a receptacle installed for electric discharge lighting shall be permitted to be based on 410.62(C).

Exception No. 3: Receptacles installed and labeled exclusively for the use of cord-and-plug-connected EVSE that are rating limited as per 625.42 or otherwise limited to less than the rating of the receptacle, and where the EVSE are specifically listed for use on the higher ampacity circuit.

Table 210.21(B)(3) Receptacle Ratings for Circuits Serving More Than One Receptacle or Receptacle Outlet

Circuit Rating (Amperes)	Receptacle Rating (Amperes)
15	15
20	15 or 20
30	30
40	40 or 50
50	50

Statement of Problem and Substantiation for Public Comment

In order to facilitate EV-Ready installations in shared garages, without requiring an electrician to install each EVSE later, we are proposing 80 A branch circuits with 50 A receptacles where suitably labeled, per our parallel proposals to several articles. Our Flex product is listed as 50 A output, but for use on up to 80 A branch circuits. Future products could similarly allow for 60 A output/receptacles on 90 A, 100 A, or even higher overcurrents. Article 625.42 provides for rating limits for restricted access adjustment and load management (aka EVEMS), but another option is for there to simply be a fixed apparent mismatch between output (perhaps 12 A) and branch circuit or plug/receptacle (for example 50 A, such that three such EVSE can share a single circuit). An attempt to overload the circuit would at worst result in tripping the breaker since the receptacle matches the maximum individual load, and the branch circuit wiring is matched to the breaker.

Related Item

• PI-3111 requested multi-outlet branches, and FR-9416 allowed an exception.	• PC-1816 proposes effectively excepting EVSE from matched branch/outlet subject to compliance with 210.21, 625.44, etc.	• PC-2014 proposes allowing fixed derated EVSE to share a branch, in addition to restricted access adjustment, or load managment	• PC-2020 proposes sizing overcurrent per adjustment, load management, or limit of overcurrent from listing.	• PC-2021 proposes recognizing that rating can be adjusted and still load managed.	• PC-2025 proposes allowing 14-60R for portable equipment	• PC-2026 proposes allowing 14-60R for fastened-in-place equipment

Submitter Information Verification

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Submittal Date: Tue Aug 17 20:53:15 EDT 2021
Committee: NEC-P02

Public Comment No. 237-NFPA 70-2021 [Section No. 210.23(A)(1)]

(1) Loads Permitted for 10-Ampere Branch Circuits.

A 10-ampere branch circuit shall be permitted to supply one or more of the following:

(1) Lighting outlets

(2) Dwelling unit exhaust fans on bathroom or laundry room lighting circuits

(3) Gas fireplace igniter and fan where the gas fireplace is ~~on an~~ supplied by an individual branch circuit

Statement of Problem and Substantiation for Public Comment

This PI proposes to clarify the requirement in list item (3) to more accurately describe the wiring associated with the individual branch circuit.

Related Item

• FR 9100

Submitter Information Verification

Submitter Full Name: Vincent Della Croce

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Submittal Date: Thu Jul 15 09:45:34 EDT 2021

Committee: NEC-P02

Public Comment No. 242-NFPA 70-2021 [Section No. 210.23(A)(2)]

(2) Loads Not Permitted for 10-Ampere Branch Circuits.

A 10-ampere branch circuit shall not be permitted ~~for any~~ to supply any of the following:

(1) ~~Supplying receptacle~~ Receptacle outlets

(2) ~~Supplying fixed~~ Fixed appliances, except as permitted for individual branch circuits

(3) ~~Supplying garage~~ Garage door openers

(4) ~~Supplying laundry~~ Laundry equipment

Statement of Problem and Substantiation for Public Comment

This PI proposes to remove the redundant use of the word "supplying" from the list items, and relocate it to the parent text prior to the list items. No technical changes are proposed. The proposed change will enhance clarity and imrpove consistency.

Related Item

• PI 9100

Submitter Information Verification

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Submittal Date: Thu Jul 15 11:09:55 EDT 2021

Committee: NEC-P02

Public Comment No. 1769-NFPA 70-2021 [Section No. 210.24]

210.24 Branch-Circuit Requirements — Summary.

The requirements for circuits that have two or more outlets or receptacles, other than the receptacle circuits of 210.11(C)(1), (C)(2), and (C)(3), are summarized in Table 210.24(a) for copper conductors and Table 210.24(b) for aluminum and copper-clad aluminum conductors. Table 210.24(a) and Table 210.24(b) provide only a summary of minimum requirements. See 210.19, 210.20, and 210.21 for the specific requirements applying to branch circuits.

Table 210.24(a) Summary of Branch-Circuit Requirements — Copper Conductors

Circuit Rating	10 A	15 A	20 A	30 A	40 A	50 A
Conductors (min. size):						
Circuit wires[1]	~~14~~ 16	14	12	10	8	6
Taps	~~14~~ 16	14	14	14	12	12
Fixture wires and cords			See 240.5.			
Overcurrent Protection	**10 A**	**15 A**	**20 A**	**30 A**	**40 A**	**50 A**
Outlet devices:						
Lampholders permitted	Any type	Any type	Any type	Heavy duty	Heavy duty	Heavy duty
Receptacle rating[2]	See note 2.	15 max. A	15 A or 20 A	30 A	40 A or 50 A	50 A
Maximum Load	**10 A**	**15 A**	**20 A**	**30 A**	**40 A**	**50 A**
Permissible load	See 210.23(A).	See 210.23(B).	See 210.23(B).	See 210.23(C).	See 210.23(D).	See 210.23(D).

[1]For receptacle rating of cord-connected electric-discharge luminaires, see 410.62(C).

[2]Branch circuits rated 10-amperes shall not be permitted to supply receptacles.

Table 210.24(b) Summary of Branch-Circuit Requirements — Aluminum and Copper-Clad Aluminum Conductors

Circuit Rating	10 A[1]	15 A	20 A	30 A	40 A	50 A	
Conductors (min. size):							
Circuit wires	14[1]	12	10	8	6	4	
Taps	14[1]	12	12	12	10	10	
Fixture wires and cords							See 240.5.
Overcurrent Protection	**10 A[1]**	**15 A**	**20 A**	**30 A**	**40 A**	**50 A**	
Outlet devices:							
Lampholders permitted	Any type	Any type	Any type	Heavy duty	Heavy duty	Heavy duty	
Receptacle rating[2]	See note 3.	15 max. A	15 A or 20 A	30 A	40 A or 50 A	50 A	
Maximum Load	**10 A[1]**	**15 A**	**20 A**	**30 A**	**40 A**	**50 A**	
Permissible load	See 210.23(A).	See 210.23(B).	See 210.23(B).	See 210.23(C).	See 210.23(D).	See 210.23(D).	

[1]Copper-clad aluminum conductors only.

[2]For receptacle rating of cord-connected electric-discharge luminaires, see 410.62(C).

[3]Branch circuits rated 10-amperes shall not be permitted to supply receptacles.

Statement of Problem and Substantiation for Public Comment

To align this table with changes made in Table 310.16 during the First Draft (to allow 16 AWG copper conductors at an ampacity of 10 Amps at 60C).

Related Item

- FR-9190

Submitter Information Verification

Submitter Full Name: Dave Watson
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Submittal Date:	Tue Aug 17 17:11:41 EDT 2021
Committee:	NEC-P02

Public Comment No. 1772-NFPA 70-2021 [Section No. 210.24]

210.24 Branch-Circuit Requirements — Summary.

The requirements for circuits that have two or more outlets or receptacles, other than the receptacle circuits of 210.11(C)(1), (C)(2), and (C)(3), are summarized in Table 210.24(a) for copper conductors and Table 210.24(b) for aluminum and copper-clad aluminum conductors. Table 210.24(a) and Table 210.24(b) provide only a summary of minimum requirements. See 210.19, 210.20, and 210.21 for the specific requirements applying to branch circuits.

Table 210.24(a) Summary of Branch-Circuit Requirements — Copper Conductors

Circuit Rating	10 A	15 A	20 A	30 A	40 A	50 A
Conductors (min. size):	–	–	–			
Circuit wires[1]	14	14	12	10	8	6
Taps	14	14	14	14	12	12
Fixture wires and cords			See 240.5.	–	–	–
Overcurrent Protection	**10 A**	**15 A**	**20 A**	**30 A**	**40 A**	**50 A**
Outlet devices:	–	–	–	–	–	–
Lampholders permitted	Any type	Any type	Any type	Heavy duty	Heavy duty	Heavy duty
Receptacle rating[2]	See note 2.	15 max. A	15 A or 20 A	30 A	40 A or 50 A	50 A
Maximum Load	**10 A**	**15 A**	**20 A**	**30 A**	**40 A**	**50 A**
Permissible load	See 210.23(A).	See 210.23(B).	See 210.23(B).	See 210.23(C).	See 210.23(D).	See 210.23(D).

[1]For receptacle rating of cord-connected electric-discharge luminaires, see 410.62(C).

[2]Branch circuits rated 10-amperes shall not be permitted to supply receptacles.

Table 210.24(b) Summary of Branch-Circuit Requirements — Aluminum and Copper-Clad Aluminum Conductors

Circuit Rating	~~10 A~~ ~~1~~		15 A	20 A	30 A	40 A	50 A
Conductors (min. size):	–	–	–	–	–	–	
Circuit wires	~~14~~ ~~1~~		12	10	8	6	4
Taps	~~14~~ ~~1~~		12	12	12	10	10
Fixture wires and cords	–	–	–				See 240.5.
Overcurrent Protection	~~**10 A**~~ ~~1~~		**15 A**	**20 A**	**30 A**	**40 A**	**50 A**
Outlet devices:	–	–	–	–	–	–	
Lampholders permitted		Any type	Any type	~~Any type~~	Heavy duty	Heavy duty	Heavy duty
Receptacle rating[2]	~~See note 3.~~		15 max. A	15 A or 20 A	30 A	40 A or 50 A	50 A
Maximum Load	~~**10 A**~~ ~~1~~		**15 A**	**20 A**	**30 A**	**40 A**	**50 A**
Permissible load		See 210.23(~~A).See 210.23(~~ B).	See 210.23(B).	See 210.23(C).	See 210.23(D).	See 210.23(D).	

[1] ~~Copper-clad aluminum conductors only.~~

[2] For receptacle rating of cord-connected electric-discharge luminaires, see 410.62(C).

[3] Branch circuits rated 10-amperes shall not be permitted to supply receptacles.

Additional Proposed Changes

File Name	Description
PC_1447_1772_1937_1939_1940_1943_2068_2073_2075_Attachment_C_Dave_Watson.pdf	WO_2021-260_14_AWG_Copper_Clad_Aluminum_Tem _Initial_Findings.pdf

Statement of Problem and Substantiation for Public Comment

Testing performed by Southwire (at the Southwire Cofer Technology Center, an ISO 17025 accredited test lab by A2LA) indicates that the maximum temperature ratings for products made with 14 AWG Copper-Clad Aluminum conductors are exceeded when using the proposed ampacities (10 Amps at 60°C for NM-B Cable and 20 Amps at 90°C for THHN conductors installed in flexible metal conduit) while the products are installed within insulated walls and ceilings/attics that are typical of residential and commercial installations. A test report is attached, and it is anticipated that more information (including additional test reports) will be available to the code-making panel from further testing conducted by Southwire and other testing facilities. Additional information in support of this position is available for the Code-Making Panels.

Related Public Comments:

PC-1447 - Tables 310.16 and 310.17
PC-1772 - Section 210.24
PC-2075 - Section 240.4(D)
PC-1937 - Section 310.3(A)
PC-2068 - Section 330.104
PC-1939 - Section 334.104
PC-2073 - Section 336.104
PC-1940 - Section 340.104
PC-1943 - Section 406.3(D)

Related Item

• FR-9190

Submitter Information Verification

Submitter Full Name:	Dave Watson
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Submittal Date:	Tue Aug 17 17:20:57 EDT 2021
Committee:	NEC-P02

Southwire®

D.B. Cofer Technology Center

111 Development Drive • Carrollton, GA 30117

Temperature Study of
14 AWG Copper-Clad Aluminum Products
-Initial Findings-

Test Performed: August 6th – August 18th, 2021

Report Date: August 19th, 2021

Requested by: Dave Watson

Cofer Center Work Order #: 2021-260

Report by: ______________________

Steven Powers, PE

Lab Manager, Cofer Technology Center

&

____

Dave Watson

Principal Engineer, Codes & Standard Engineering

Table of Contents

Disclaimer:

Introduction

During the First Draft of the 2023 NEC, the smallest size allowed for copper-clad conductors was extended to 14 AWG (from the previous limit of 12 AWG) in several NEC sections, including Table 310.16 and Table 310.17. The proposed Table 310.16 ampacities are 10 Amps at 60℃, 15 Amps at 75℃, and 20 Amps at 90℃. The test data supplied by the American Bimetallic Association in support of this First Draft change addressed performance in open air only. Southwire believes testing in normal residential and commercial installation environments (within insulated walls and ceilings/attics) is also needed to properly assess the safety of 14 AWG copper-clad conductors at these ampacities.

Summary

Testing was performed at Southwire's D.B. Cofer Technology Center (CTC) in a climate-controlled lab. Data was gathered using equipment and processes that are part of the CTC's ISO 17025 Quality Management System. The overall procedure and test apparatus were customer defined and not a part of the CTC's ISO 17015 scope of accreditation.

The test results show that the maximum temperature ratings for products made with 14 AWG copper-clad aluminum conductors are exceeded when using the proposed ampacities (testing was performed using 10 Amps at 60℃ for NM-B Cable and 20 Amps at 90℃ for THHN conductors installed in flexible metallic conduit) while the products are installed within insulated walls and ceilings/attics that are typical of residential and commercial installations. It is anticipated that more information (including possible additions to this test report and additional test reports) will be available to the code-making panel from further testing conducted by Southwire and other testing facilities.

Samples

Southwire obtained 14 AWG copper-clad aluminum bare conductor (using AA-8000 series AL alloy and meeting ASTM B566) and used it to manufacture 14/2 NM-B Cable and 14 AWG THHN/THWN conductors. Since these sizes of copper-clad aluminum are not included within the relevant UL standards at this time (UL 719 and UL 83), we used the same constructions as required for 14 AWG copper products (allowing for the manufacturing variations required due to the lower tensile strength and temperature performance of copper-clad aluminum as compared to copper).

Procedure

Testing was performed on a custom wood and drywall apparatus according to Figure 1. The apparatus was designed to replicate the construction of a traditional wood framed residential wall and ceiling. The apparatus could be flipped 90° from a vertical position (replicating a wall) and a horizontal position (replicating a ceiling). For the data contained in this report, certified electricians were used to install the samples and make electrical connections.

Complete test setup consisted of the following elements:

1. Wooden apparatus either oriented in the vertical plane (wall) or the horizontal plane (ceiling) constructed using 2"x6" wood boards and ½" sheetrock,
2. Fiberglass insulation (R6.7, R13, R30),
3. Chroma programmable load current supply,
4. Fluke amp probe,
5. Voltage meters,
6. Graphtec temperature datalogger.

Table 1: Equipment Used

Equipment	Cofer Asset #
Graphtec GL 840 Data Logger	948
Fluke 336 Clamp Meter	189
Chroma Model 63803 Programable Load	NA
Fluke 289 Multimeter	267
Fluke 789 Multimeter	679

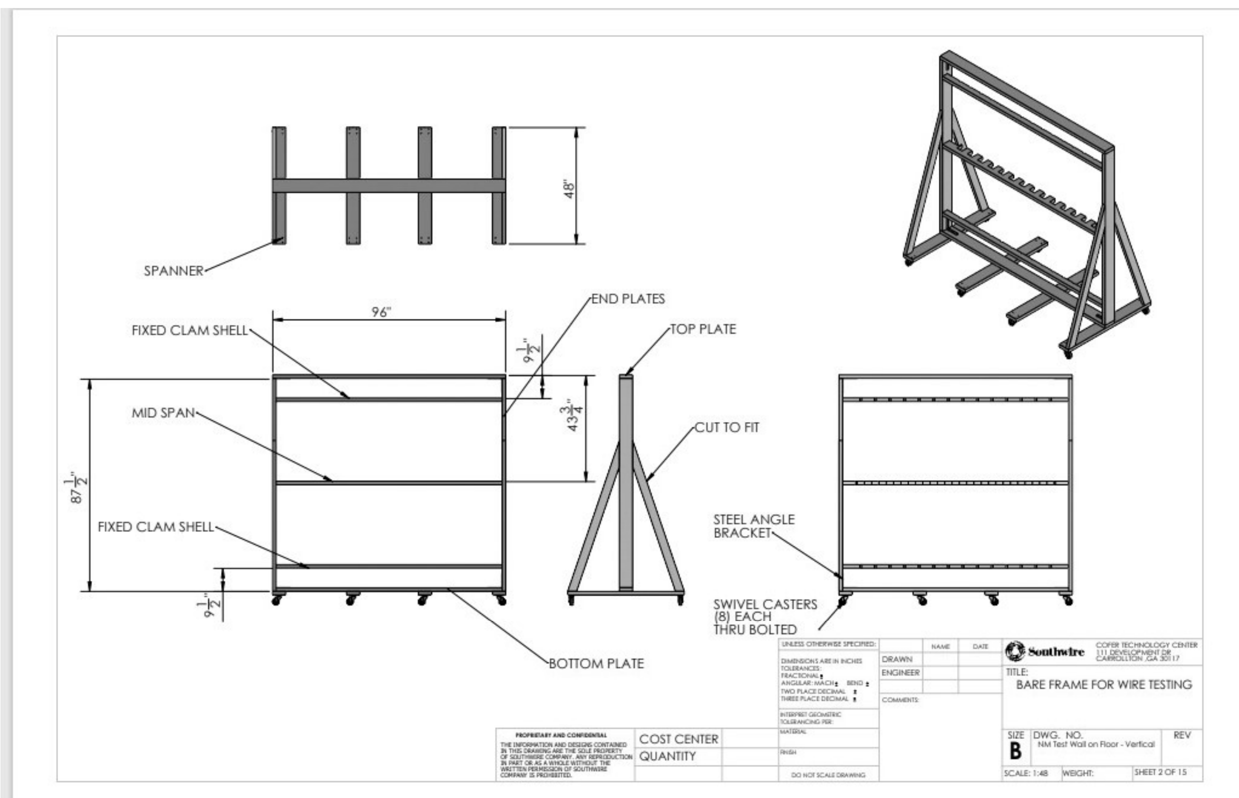


Figure 1: Test Apparatus

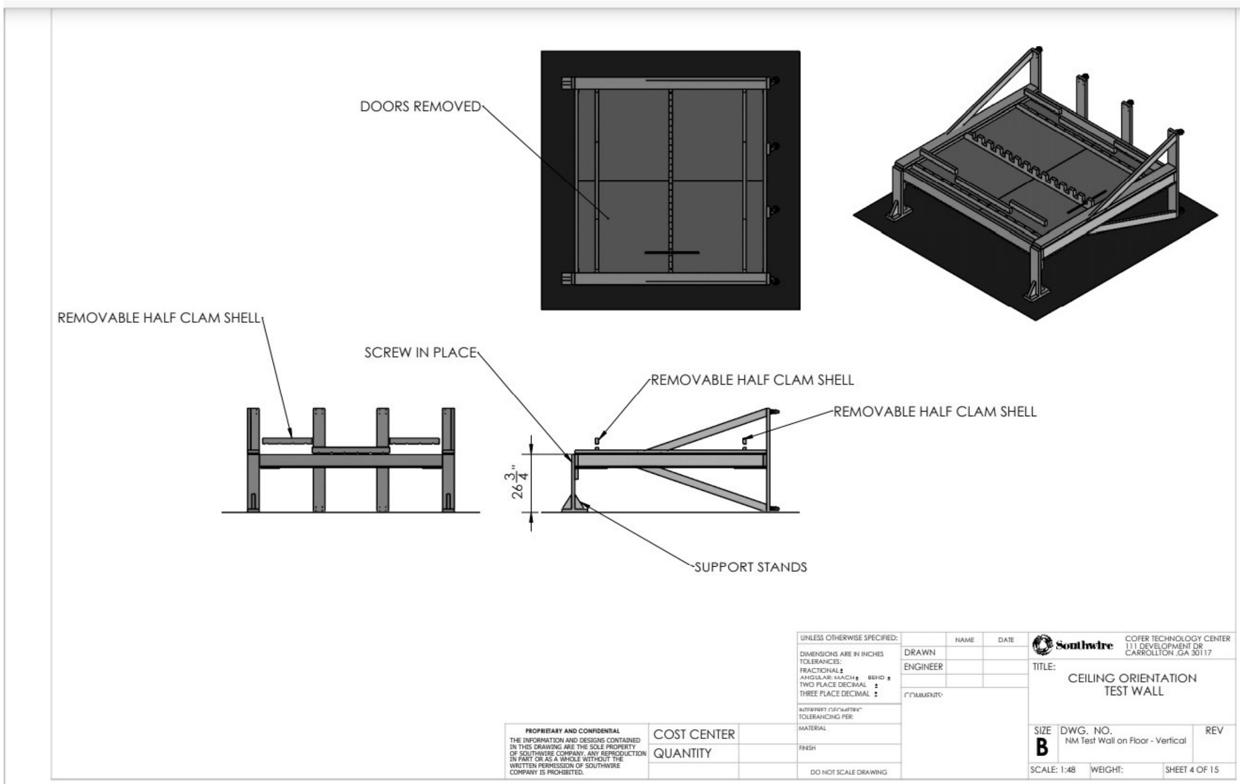


Figure 2: Test Apparatus in Ceiling Configuration

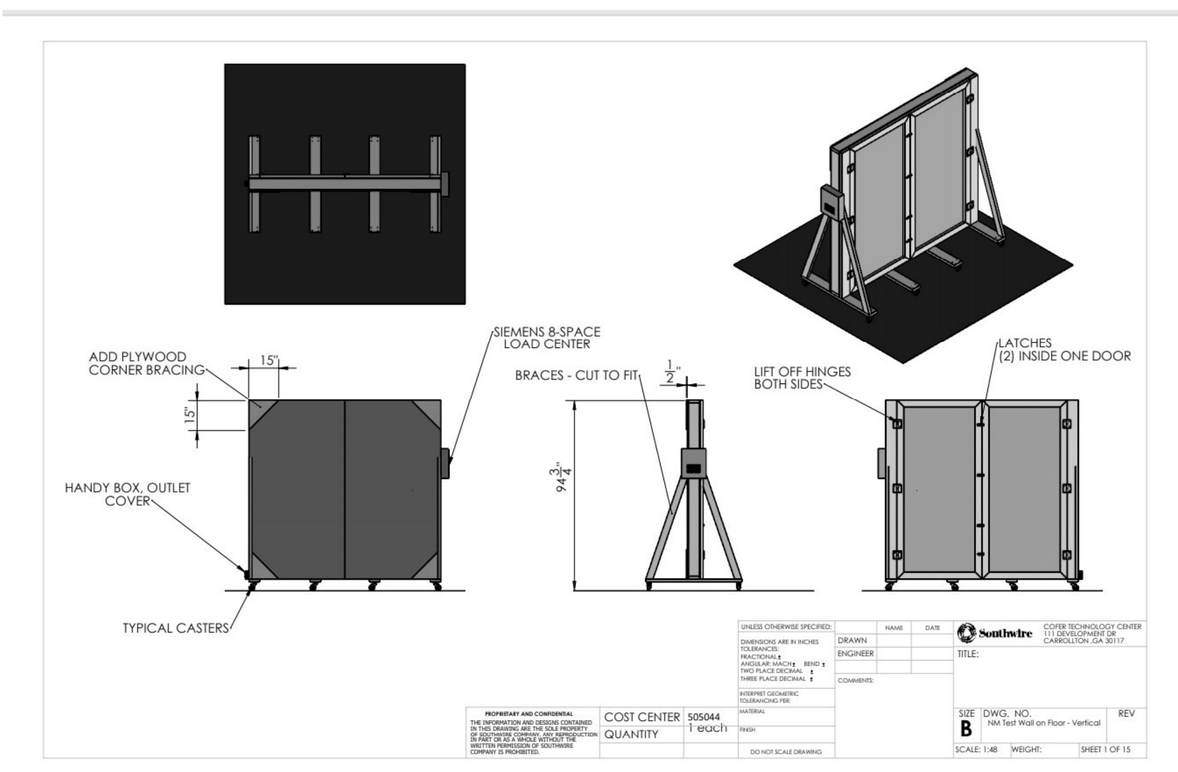


Figure 3: Test Apparatus in Wall Configuration

The following procedure was used for each test.

1. A sufficient length of NM cable or THHN (typically 61 feet) is cut from a coil,
2. While the structure is in the horizontal orientation, one end is terminated in a Siemens EQ 125 Amp 8-Space 16-Circuit Main Lug Flush Mount Indoor Load Center to a Siemens Single-Pole Type QP Circuit Breaker, the amperage based upon the capability of the cable (10, 15, 20 amps typical) or specified by the customer,
3. The sample is secured in the wall at the specified spacing, typically 12" by pulling it through ¾" holes that were drilled through the boards located on either end of the structure,
4. The samples were secured to the apparatus,
   a. The cable samples are secured to the middle board with nail on staples listed for NM cable (vertical wall and NM-B),
   b. The THHN samples were pulled through the flexible metal conduit (FMC), and the FMC was terminated in the electrical boxes of both end of the circuit,
5. The other end of the cable is terminated to a duplex outlet on the opposite side of the structure,
6. Thermocouples are installed in the apparatus as follows:
   a. One ambient (#8),
   b. One placed inside the cable where it enters the single gang receptacle box (#1) and another one inside the cable where it enters the load center panel (#7),
   c. Five others placed inside the sample
      i. The thermocouples in the cable samples are placed approximately 10 feet apart by cutting a small slit in the outer jacket and placing the end of the thermocouple next to the conductors under the paper then two (2) wraps of electrical tape are placed over the slit (#2 through #6),
      ii. The thermocouples in the FMC were taped to the black conductor using electrical tape every 10 feet,
   d. One on the black conductor connected to the breaker right at the terminating screw (#9)
7. A specified R-value layer of insulation is placed over the sample and is tucked into the structure to minimize air gaps/heat loss,
8. For wall testing, the sheetrock doors are installed while the structure is horizontal, locked and then the structure is stood to the vertical orientation,
9. For ceiling testing, the sheetrock doors are left off, and the apparatus is left in the horizontal position,
10. The incoming power to the panel is turned ON,
11. The initial incoming voltage and outgoing voltage is recorded,
12. The temperature data logger data collection is launched,
13. The power supply is set to the specified current level (10, 12, 15, 20 amps typical) and is engaged,
14. The current level is verified with the amp probe,
15. The loaded voltages as shown in the corresponding voltage meters are recorded.

Each thermocouple was constructed at the CTC from special-limit-of-error thermocouple wire. After each thermocouple was welded and connected to the data logger, the thermocouple end was placed in an ice bath to verify its functionality and accuracy.

After a specified amount of time or at the point where the cable exceeds the temperature limitation as set forth in the NEC for NM-B Cable (60℃) or THHN/THWN conductors (90℃) as indicated on the datalogger screen, the power supply is turned off and the data logger collection is stopped.

Results

Several limits were observed for this study. These limits, coupled with judgement, were considered when determining when to stop a test. Some of these limits include the following:

- Temperature limit of 60°C for NM-B Cable,
- Temperature limit of 90°C for THHN/THWN conductors installed in conduit,
- A temperature rise of 30°C above ambient for NM-B Cable,
- A temperature rise of 60°C above ambient for THHN/THWN conductors installed in conduit,
- An elapsed time of 3 hours ("continuous use" classification).

For the ampacities given in NEC Tables 310.16 and 310.17, the ambient temperature is 30℃. The total temperature achieved by the cable or conductor is composed of the ambient temperature plus the temperature rise above ambient due to conduction of current. For NM-B Cable (Max Temp = 60℃), this maximum temperature rise is 30℃ above ambient. For THHN/THWN conductors installed in conduit (Max Temp = 90℃), this maximum temperature rise is 60℃ above ambient. Normally when installation occurs in an area with a lower ambient temperature, the allowable conductor ampacity is increased per NEC 310.15. However, this testing had to be performed with the appropriate OCPD sizes (10 Amps for NM-B Cable and 20 Amps for THHN/THWN conductors in conduit) to ensure accuracy of the results. Since our testing occurred in an environment with an ambient temperature of less than 30℃ and we were limited in the current we could use for testing by the OCPD, we are using the maximum temperature rise above ambient as the measure of pass/fail results.

The temperature on multiple channels on Figure 2 exceeded the limit of the data logger after approximately 26 minutes. The test lasted for 47 minutes before it was decided to stop testing. The maximum temperature recorded was 102°C above ambient.

See Figures 4 and 5 below for the temperature profile for AWG 14/2 copper-clad aluminum and 14 AWG THHN copper-clad aluminum while the apparatus was in the ceiling orientation. See Figures 6 and 7 for data in the wall orientation.

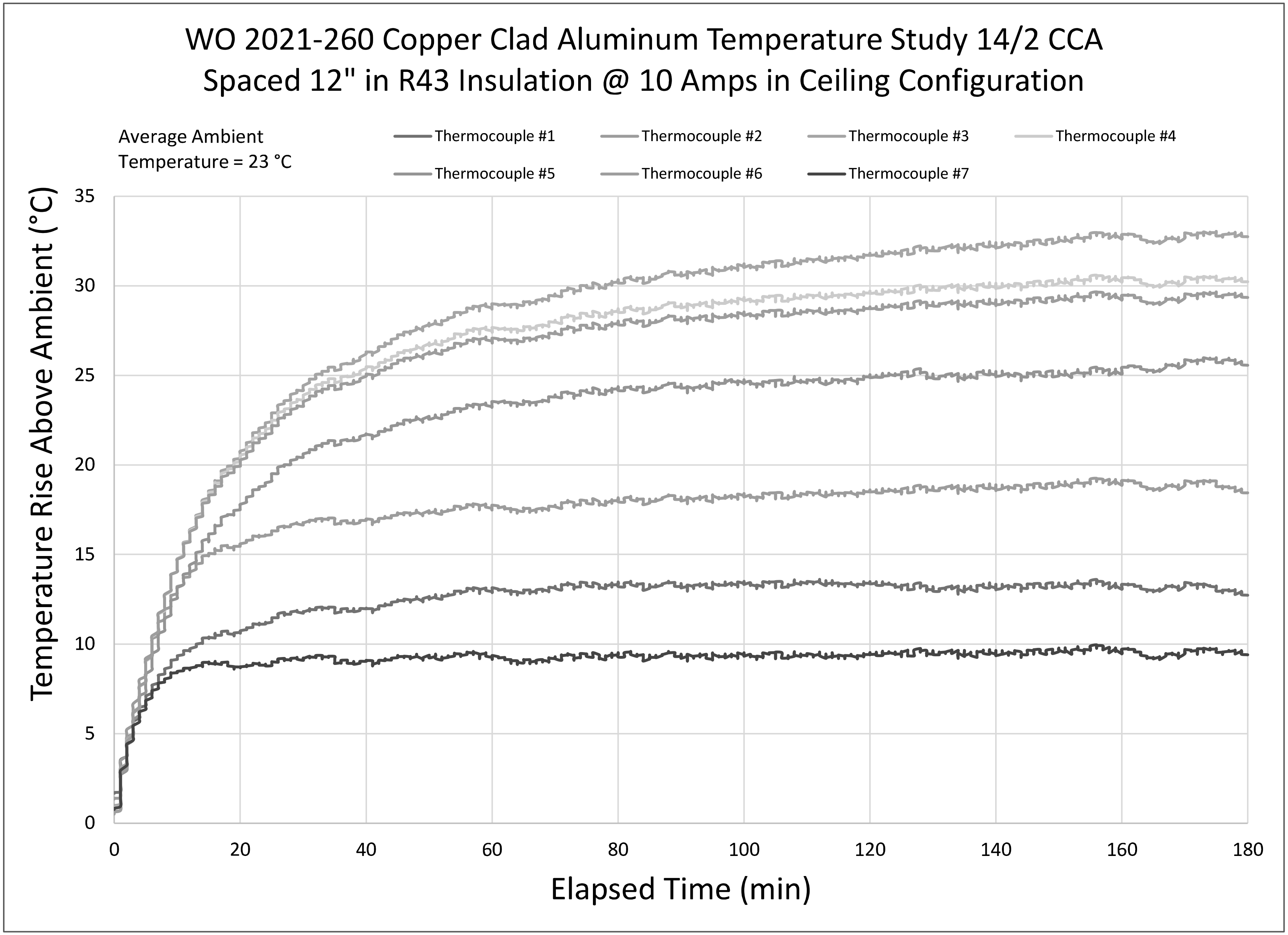


Figure 4: 14/2 CCA Spaced 12” in R43 Insulation at 10 Amps in Ceiling Configuration

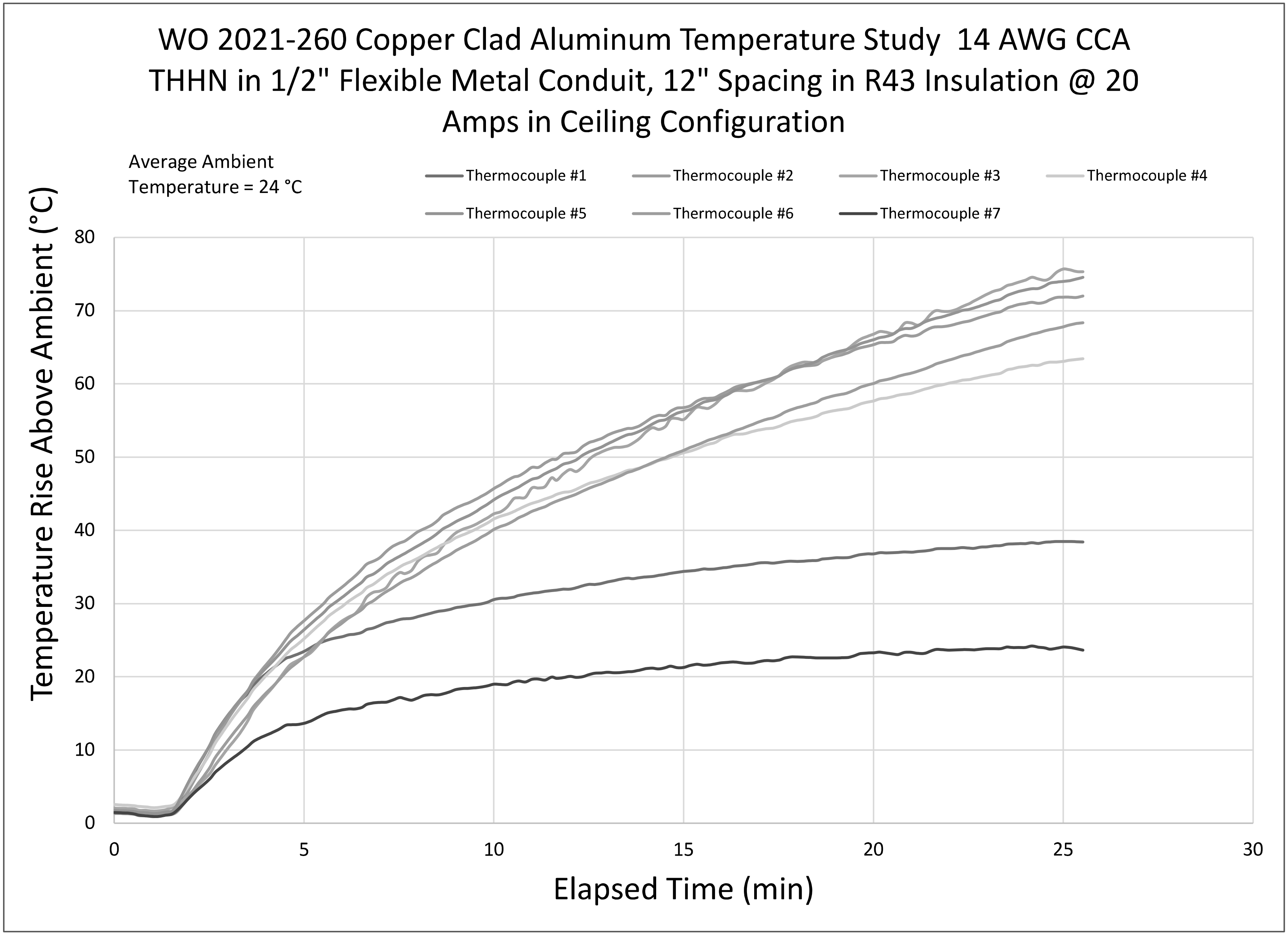


Figure 5: 14 AWG CCA THHN in ½” FMC Spaced 12” in R43 Insulation at 20 Amps in Ceiling Configuration

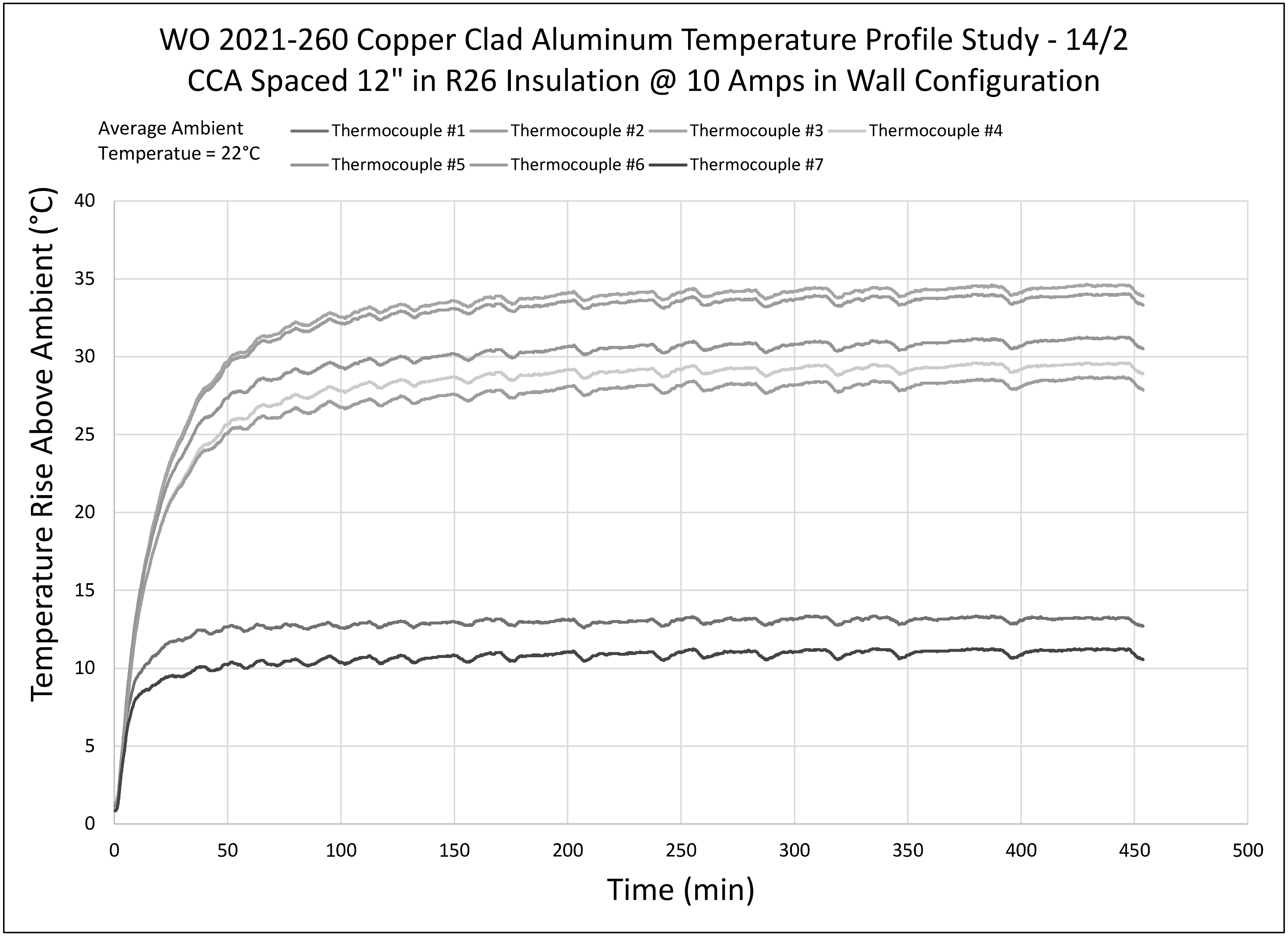


Figure 6: 14/2 CCA Spaced 12” in R26 Insulation at 10 Amps in Wall Configuration

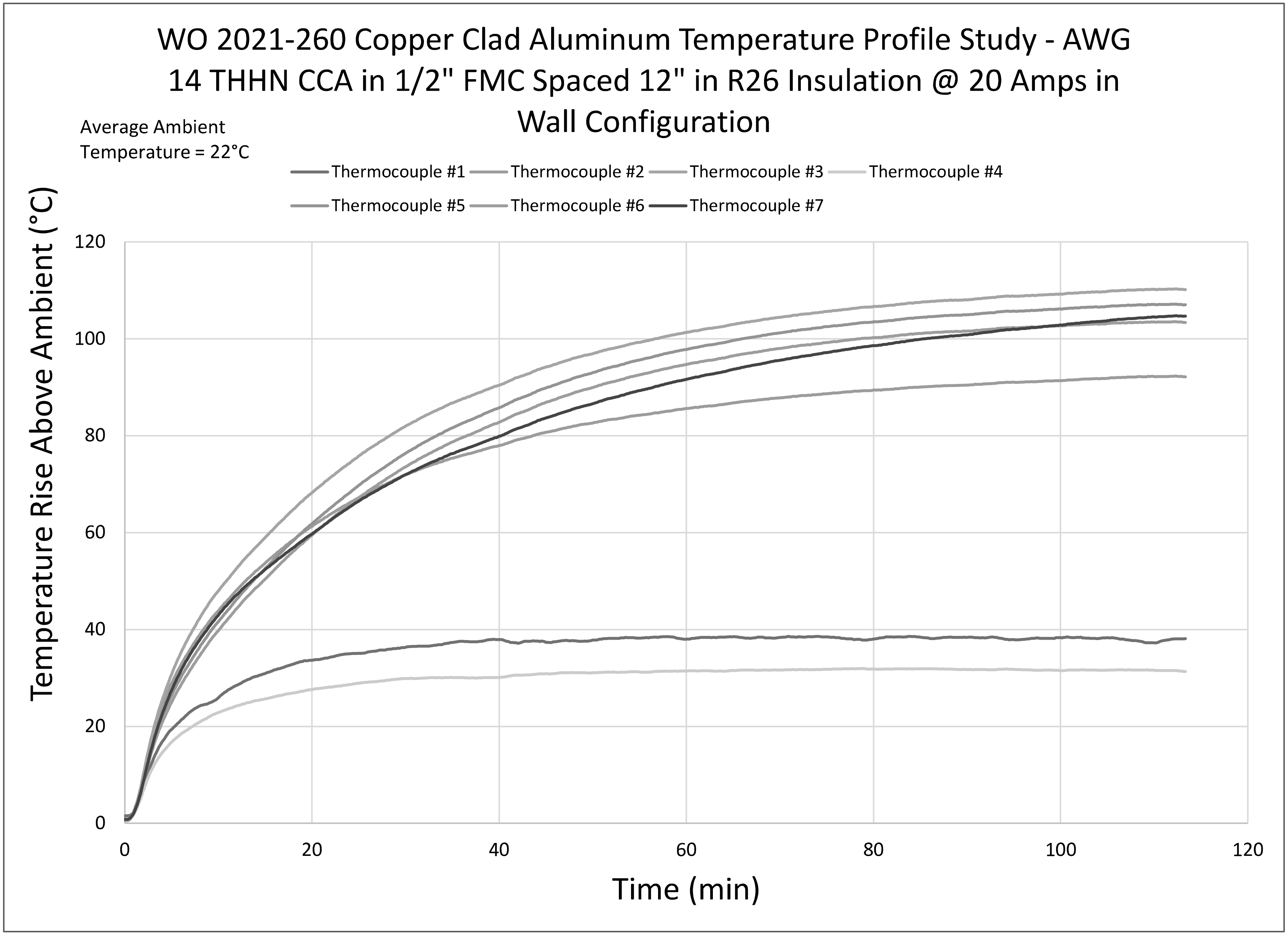


Figure 7: AWG 14 THHN CCA in ½" FMC Spaced 12" in R26 Insulation at 20 Amps in Wall Configuration

Appendix A: Calibration Certificates

Applied Technical Services

Certificate of Calibration

Certificate #3019464

ACCREDITED
CALIBRATION CERT: #1888.03

Customer:
Southwire Company - D.B.Cofer
D.B.Cofer Technology Center
111 Development Drive
Carrollton, GA 30119

Calibration Location:
Southwire Company - D.B.Cofer
D.B.Cofer Technology Center
111 Development Drive
Carrollton, GA 30119

Instrument Information:

Manufacturer: Fluke
Model Number: 336
Description: Clamp Meter, AC / DC
Asset Number: 189
Serial Number: 88307992
PO Number: 4503214624

Calibration Information/Results:

As Found Condition : In Tolerance
Action Taken / As Left: In Tolerance - No Adjustment
Temperature: 71° F
Humidity: 55% RH
Calibration Date: 01-Jun-2021
Calibration Due Date: 01-Jun-2022
Calibration Interval: 12 Months

Calib. Procedure: ATS-1044 Rev 2:Calibration of Clamp-On Meters

This instrument has been calibrated using primary or secondary standards whose calibration is traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST) or applicable ASTM specification number for hardness testing equipment. Some measurements are traceable to natural, physical constants, consensus standards, or ratio type measurements.
The reported expanded measurement uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a confidence level of approximately 95%. This calibration certificate may contain data that is not covered by the Scope of Accreditation. The unaccredited test points, where applicable, are indicated by an asterisk (*), or confined to clearly marked sections. Functional tests are not accredited. The expanded measurement uncertainty is not considered when determining in-tolerance or out-of-tolerance conditions. Results are reviewed, if applicable, to establish where any measurement results exceeded the stated calibration tolerance and to communicate results by means of this certificate.
All calibrations are performed in accordance with the ATS Quality Manual QM1, Rev. 18, dated 10/16/20. Applied Technical Services, Inc.'s Quality System complies with the applicable requirements of ANSI/NCSL Z540-1, ISO 9001:2015, 10CFR50 Appendix B, 10CFR Part 21, and ISO/IEC 17025:2017. The reported data is valid only at the time of the test and related only to the item calibrated. Calibration due dates appearing on this certificate and calibration label are determined by the client and do not imply continued conformance to specifications. This certificate shall not be reproduced except in full, without written permission of Applied Technical Services, Inc.

Technical Remarks:

Calibrated By: Taylor, Collin A — Calibration Tech
Name — Title

Calibration Equipment Utilized

Standard I.D.	Mfg.	Model No.	Description	Serial	Cal. Date	Due Date
ATS-04852	Fluke	5522A/1G	Calibrator, Multi-Function	2034901	02/03/2021	02/03/2022
ATS-4049	Fluke	5500A/COIL	Current Amplifier, 50 Turn Current Coil	SV0001521	03/11/2021	03/11/2026

Calibration Data

FUNCTION TESTED	Nominal Value	CALIBRATION TOLERANCE	As Found	Out of Tol	As Left
AC Voltage Accuracy	20.0 V @ 50 Hz	19.3 to 20.7 V [EMU 58 mV]	20.2		Same
|	600.0 V @ 50 Hz	593.5 to 606.5 V [EMU 200 mV]	600.9		Same
|	600.0 V @ 400 Hz	563.5 to 636.5 V [EMU 200 mV]	593.2		Same
DC Voltage Accuracy	20.0 V	19.3 to 20.7 V [EMU 58 mV]	20.3		Same
|	-20.0 V	-20.7 to -19.3 V [EMU 58 mV]	-20.1		Same
|	600.0 V	593.5 to 606.5 V [EMU 59 mV]	601.3		Same
|	-600.0 V	-606.5 to -593.5 V [EMU 59 mV]	-601.2		Same
Continuity Test: Audible Tone	25 Ohm	Pass/Fail	PASS		Same
Resistance Accuracy	600.0 Ohm	590.5 to 609.5 Ohm [EMU 61 mOhm]	603.0		Same

Calibration Data

FUNCTION TESTED	Nominal Value	CALIBRATION TOLERANCE	As Found	Out of Tol	As Left
|	6000 Ohm	5905 to 6095 Ohm [EMU 610 mOhm]	6009		Same
AC Current Accuracy	20.0 A @ 50 Hz	19.1 to 20.9 A [EMU 0.37 A]	20.1		Same
|	200.0 A @ 50 Hz	195.5 to 204.5 A [EMU 2 A]	200.5		Same
|	500.0 A @ 50 Hz	489.5 to 510.5 A [EMU 3.7 A]	501.2		Same
|	600.0 A @ 50 Hz	587.5 to 612.5 A [EMU 4.3 A]	601.3		Same
INRUSH Verification	250.0 A @ 60 Hz	245.6 to 255.6 A [EMU 2.3 A]	253.6		Same
DC Current Accuracy	0.0 A	-0.5 to 0.5 A [EMU 58 mA]	0.0		Same
|	20.0 A	19.1 to 20.9 A [EMU 0.25 A]	20.2		Same
|	-20.0 A	-20.9 to -19.1 A [EMU 0.25 A]	-20.2		Same
|	600.0 A	587.5 to 612.5 A [EMU 3.5 A]	601.3		Same
|	-600.0 A	-612.5 to -587.5 A [EMU 3.5 A]	-601.0		Same

End Of Report

Applied Technical Services

Certificate of Calibration

Certificate #3019662

ACCREDITED
CALIBRATION CERT: #1888.03

Customer:
Southwire Company - D.B.Cofer
D.B.Cofer Technology Center
111 Development Drive
Carrollton, GA 30119

Calibration Location:
Southwire Company - D.B.Cofer
D.B.Cofer Technology Center
111 Development Drive
Carrollton, GA 30119

Instrument Information:

Manufacturer:	Graphtec
Model Number:	GL840
Description:	Data Acquisition Unit - Temperature
Asset Number:	948
Serial Number:	C61215753
PO Number:	4503214624

Calibration Information/Results:

As Found Condition :	In Tolerance
Action Taken / As Left:	In Tolerance - No Adjustment
Temperature:	71° F
Humidity:	55% RH
Calibration Date:	02-Jun-2021
Calibration Due Date:	02-Jun-2022
Calibration Interval:	12 Months

Calib. Procedure: ATS-1046 Rev 2:Calibration of Data Loggers/Chart Recorders/Multifunction Recorders

This instrument has been calibrated using primary or secondary standards whose calibration is traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST) or applicable ASTM specification number for hardness testing equipment. Some measurements are traceable to natural, physical constants, consensus standards, or ratio type measurements.
The reported expanded measurement uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a confidence level of approximately 95%. This calibration certificate may contain data that is not covered by the Scope of Accreditation. The unaccredited test points, where applicable, are indicated by an asterisk (*), or confined to clearly marked sections. Functional tests are not accredited. The expanded measurement uncertainty is not considered when determining in-tolerance or out-of-tolerance conditions. Results are reviewed, if applicable, to establish where any measurement results exceeded the stated calibration tolerance and to communicate results by means of this certificate.
All calibrations are performed in accordance with the ATS Quality Manual QM1, Rev. 18, dated 10/16/20. Applied Technical Services, Inc.'s Quality System complies with the applicable requirements of ANSI/NCSL Z540-1, ISO 9001:2015, 10CFR50 Appendix B, 10CFR Part 21, and ISO/IEC 17025:2017. The reported data is valid only at the time of the test and related only to the item calibrated. Calibration due dates appearing on this certificate and calibration label are determined by the client and do not imply continued conformance to specifications. This certificate shall not be reproduced except in full, without written permission of Applied Technical Services, Inc.

Technical Remarks:

Calibrated By: Fugita, Aaron J (Name) — Calibration Tech (Title)

Calibration Equipment Utilized

Standard I.D.	Mfg.	Model No.	Description	Serial	Cal. Date	Due Date
ATS-04962	Fluke	5522A	Calibrator, Multi-Function	2356901	10/07/2020	10/07/2021

Calibration Data

FUNCTION TESTED	Nominal Value	CALIBRATION TOLERANCE	As Found	Out of Tol	As Left
CH. 1	50.00 °C	48.45 to 51.55 °C [EMU 0.07 °C]	49.10		Same
CH.1	200.00 °C	198.45 to 201.55 °C [EMU 0.09 °C]	199.45		Same
CH . 2	50.00 °C	48.45 to 51.55 °C [EMU 0.07 °C]	49.65		Same
CH. 2	200.00 °C	198.45 to 201.55 °C [EMU 0.09 °C]	199.55		Same
CH. 3	50.00 °C	48.45 to 51.55 °C [EMU 0.07 °C]	49.45		Same
CH. 3	200.00 °C	198.45 to 201.55 °C [EMU 0.09 °C]	199.50		Same
CH. 4	50.00 °C	48.45 to 51.55 °C [EMU 0.07 °C]	49.50		Same
CH. 4	200.00 °C	198.45 to 201.55 °C [EMU 0.09 °C]	199.50		Same
CH. 5	50.00 °C	48.45 to 51.55 °C [EMU 0.07 °C]	49.75		Same
CH. 5	200.00 °C	198.45 to 201.55 °C [EMU 0.09 °C]	199.60		Same

Calibration Data

FUNCTION TESTED	Nominal Value	CALIBRATION TOLERANCE	As Found	Out of Tol	As Left
CH. 6	50.00 °C	48.45 to 51.55 °C [EMU 0.07 °C]	49.55		Same
CH. 6	200.00 °C	198.45 to 201.55 °C [EMU 0.09 °C]	199.50		Same
CH. 7	50.00 °C	48.45 to 51.55 °C [EMU 0.07 °C]	49.50		Same
CH. 7	200.00 °C	198.45 to 201.55 °C [EMU 0.09 °C]	199.50		Same
CH. 8	50.00 °C	48.45 to 51.55 °C [EMU 0.07 °C]	49.55		Same
CH. 8	200.00 °C	198.45 to 201.55 °C [EMU 0.09 °C]	199.30		Same
CH. 9	50.00 °C	48.45 to 51.55 °C [EMU 0.07 °C]	49.40		Same
CH. 9	200.00 °C	198.45 to 201.55 °C [EMU 0.09 °C]	199.45		Same
CH. 10	50.00 °C	48.45 to 51.55 °C [EMU 0.07 °C]	49.55		Same
CH. 10	200.00 °C	198.45 to 201.55 °C [EMU 0.09 °C]	199.65		Same
CH. 11	50.00 °C	48.45 to 51.55 °C [EMU 0.07 °C]	49.90		Same
CH. 11	200.00 °C	198.45 to 201.55 °C [EMU 0.09 °C]	199.80		Same
CH. 12	50.00 °C	48.45 to 51.55 °C [EMU 0.07 °C]	49.90		Same
CH. 12	200.00 °C	198.45 to 201.55 °C [EMU 0.09 °C]	199.80		Same
CH. 13	50.00 °C	48.45 to 51.55 °C [EMU 0.07 °C]	49.90		Same
CH. 13	200.00 °C	198.45 to 201.55 °C [EMU 0.09 °C]	199.80		Same
CH. 14	50.00 °C	48.45 to 51.55 °C [EMU 0.07 °C]	49.80		Same
CH. 14	200.00 °C	198.45 to 201.55 °C [EMU 0.09 °C]	199.80		Same
CH. 15	50.00 °C	48.45 to 51.55 °C [EMU 0.07 °C]	49.80		Same
CH. 15	200.00 °C	198.45 to 201.55 °C [EMU 0.09 °C]	199.70		Same
CH. 16	50.00 °C	48.45 to 51.55 °C [EMU 0.07 °C]	49.60		Same
CH.16	200.00 °C	198.45 to 201.55 °C [EMU 0.09 °C]	199.60		Same
CH .17	50.00 °C	48.45 to 51.55 °C [EMU 0.07 °C]	49.90		Same
CH. 17	200.00 °C	198.45 to 201.55 °C [EMU 0.09 °C]	199.50		Same
CH. 18	50.00 °C	48.45 to 51.55 °C [EMU 0.07 °C]	49.90		Same
CH. 18	200.00 °C	198.45 to 201.55 °C [EMU 0.09 °C]	199.80		Same
CH. 19	50.00 °C	48.45 to 51.55 °C [EMU 0.07 °C]	49.70		Same
CH. 19	200.00 °C	198.45 to 201.55 °C [EMU 0.09 °C]	199.80		Same
CH. 20	50.00 °C	48.45 to 51.55 °C [EMU 0.07 °C]	50.10		Same
CH. 20	200.00 °C	198.45 to 201.55 °C [EMU 0.07 °C]	200.20		Same

End Of Report

Applied Technical Services

Certificate of Calibration

Certificate #3019509

ACCREDITED
CALIBRATION CERT: #1888.03

Customer:
Southwire Company - D.B.Cofer
D.B.Cofer Technology Center
111 Development Drive
Carrollton, GA 30119

Calibration Location:
Southwire Company - D.B.Cofer
D.B.Cofer Technology Center
111 Development Drive
Carrollton, GA 30119

Instrument Information:

Manufacturer: Fluke
Model Number: 289
Description: Multimeter, Digital - Handheld
Asset Number: 267
Serial Number: 10140030
PO Number: 4503214624

Calibration Information/Results:

As Found Condition : In Tolerance
Action Taken / As Left: In Tolerance - No Adjustment
Temperature: 71° F
Humidity: 54% RH
Calibration Date: 01-Jun-2021
Calibration Due Date: 01-Jun-2022
Calibration Interval: 12 Months

Calib. Procedure: ATS-1040 Rev 2:Calibration of Handheld Digital Multimeters

This instrument has been calibrated using primary or secondary standards whose calibration is traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST) or applicable ASTM specification number for hardness testing equipment. Some measurements are traceable to natural, physical constants, consensus standards, or ratio type measurements.
The reported expanded measurement uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a confidence level of approximately 95%. This calibration certificate may contain data that is not covered by the Scope of Accreditation. The unaccredited test points, where applicable, are indicated by an asterisk (*), or confined to clearly marked sections. Functional tests are not accredited. The expanded measurement uncertainty is not considered when determining in-tolerance or out-of-tolerance conditions. Results are reviewed, if applicable, to establish where any measurement results exceeded the stated calibration tolerance and to communicate results by means of this certificate.
All calibrations are performed in accordance with the ATS Quality Manual QM1, Rev. 18, dated 10/16/20. Applied Technical Services, Inc.'s Quality System complies with the applicable requirements of ANSI/NCSL Z540-1, ISO 9001:2015, 10CFR50 Appendix B, 10CFR Part 21, and ISO/IEC 17025:2017. The reported data is valid only at the time of the test and related only to the item calibrated. Calibration due dates appearing on this certificate and calibration label are determined by the client and do not imply continued conformance to specifications. This certificate shall not be reproduced except in full, without written permission of Applied Technical Services, Inc.

Technical Remarks:

Calibrated By: Taylor, Collin A — Calibration Tech
Name — Title

Calibration Equipment Utilized

Standard I.D.	Mfg.	Model No.	Description	Serial	Cal. Date	Due Date
ATS-04852	Fluke	5522A/1G	Calibrator, Multi-Function	2034901	02/03/2021	02/03/2022

Calibration Data

FUNCTION TESTED	Nominal Value	CALIBRATION TOLERANCE	As Found	Out of Tol	As Left
DC mV: 50mV Range: REL Offset On	0.000 mV	-0.020 to 0.020 mV [EMU 1.2 µV]	0.001		Same
DC mV: 50mV Range: REL Offset On	0.025 mV	0.005 to 0.045 mV [EMU 1.2 µV]	0.027		Same
|	-0.025 mV	-0.045 to -0.005 mV [EMU 1.2 µV]	-0.022		Same
|	50.000 mV	49.955 to 50.045 mV [EMU 2.1 µV]	50.011		Same
500mV Range: Rel Off	500.00 mV	499.85 to 500.15 mV [EMU 9.5 µV]	500.00		Same
|	-250.00 mV	-250.08 to -249.92 mV [EMU 8.3 µV]	-250.07		Same
mV DC/AC: 500mV Range	50.00 mV @ 0 Hz	49.97 to 50.03 mV [EMU 6.1 µV]	49.99		Same
|	250.00 mV @ 35 kHz	237.10 to 262.90 mV [EMU 96 µV]	248.33		Same
Ohms:REL On: 4 wire: 500Ohm Rng	0.00 Ohm	-0.10 to 0.10 Ohm [EMU 5.9 mOhm]	-0.01		Same
|	0.20 Ohm	0.10 to 0.30 Ohm [EMU 5.9 mOhm]	0.18		Same

Calibration Data

FUNCTION TESTED	Nominal Value	CALIBRATION TOLERANCE	As Found	Out of Tol	As Left
|	500.00 Ohm	499.65 to 500.35 Ohm [EMU 17 mOhm]	499.91		Same
5 kOhm Range: Rel Off	5.0000 kOhm	4.9973 to 5.0027 kOhm [EMU 170 mOhm]	5.0020		Same
50 kOhm Range	50.000 kOhm	49.973 to 50.027 kOhm [EMU 1.7 Ohm]	49.980		Same
500 kOhm Range	500.00 kOhm	499.60 to 500.40 kOhm [EMU 19 Ohm]	499.66		Same
5 MOhm Range	5.0000 MOhm	4.9921 to 5.0079 MOhm [EMU 0.7 kOhm]	4.9930		Same
30 MOhm Range	30.000 MOhm	29.546 to 30.454 MOhm [EMU 10 kOhm]	29.904		Same
500 MOhm Range	300.0 MOhm	275.8 to 324.2 MOhm [EMU 1 MOhm]	293.3		Same
AC mV: 50mV Range	5.000 mV @ 20Hz	4.865 to 5.135 mV [EMU 10 µV]	4.973		Same
|	50.000 mV @ 65kHz	48.210 to 51.790 mV [EMU 72 µV]	49.580		Same
ACmV: 500mV Range	50.00 mV @ 100kHz	47.85 to 52.15 mV [EMU 72 µV]	49.32		Same
|	250.00 mV @ 65 kHz	240.85 to 259.15 mV [EMU 45 µV]	248.39		Same
|	500.00 mV @ 45Hz	498.25 to 501.75 mV [EMU 140 µV]	499.90		Same
ACmV: Hz	45.000 Hz @ 500mV	44.986 to 45.014 Hz [EMU 580 µHz]	45.000		Same
|	950.00 kHz @ 600mV	949.90 to 950.10 kHz [EMU 5.8 Hz]	950.00		Same
VAC: 5V Range	0.1000 V @ 60 Hz	0.0952 to 0.1048 V [EMU 62 µV]	0.1023		Same
|	0.5000 V @ 10 kHz	0.4945 to 0.5055 V [EMU 150 µV]	0.4965		Same
|	3.0000 V @ 100 kHz	2.8160 to 3.1840 V [EMU 2.2 mV]	3.0363		Same
VAC, Hz% (Duty Cycle) 5 Vpp @50 kHz Sq.	15.00 %	4.90 to 25.10 %	23.16		Same
VAC: 50V Range	15.000 V @ 100 kHz	14.435 to 15.565 V [EMU 15 mV]	15.024		Same
VAC, Lo Pass 500V Range	50.00 V @ 60 Hz	48.60 to 51.40 V [EMU 13 mV]	50.00		Same
"Lo Pass" 500V Rng: 50V @ 1.6kHz	0.00 V	0.00 to 8.00 V	0.00		Same
VAC: 500V Range	500.00 V @ 10kHz	497.75 to 502.25 V [EMU 160 mV]	499.47		Same
VAC: 1000V Range	1000.0 V @ 10kHz	993.5 to 1006.5 V [EMU 320 mV]	999.1		Same
DCV: 5V Range	4.0000 V	3.9988 to 4.0012 V [EMU 89 µV]	4.0004		Same
DCV: 50V Range	-40.000 V	-40.012 to -39.988 V [EMU 1 mV]	-40.003		Same
DCV: 500V Range	400.00 V	399.86 to 400.14 V [EMU 10 mV]	400.05		Same
DCV: 1000V Range	600.0 V	599.6 to 600.4 V [EMU 59 mV]	600.1		Same
DCV: DC/AC	0.2000 V @ 0 Hz	0.1978 to 0.2022 V [EMU 58 µV]	0.2002		Same
|	2.0000 V @ 5kHz	1.9640 to 2.0360 V [EMU 360 µV]	1.9994		Same
ACV Peak: 4Vpp Sq Wave:+1V Offset	2.000 V @ 2 kHz	1.863 to 2.137 V [EMU 680 µV]	1.996		Same
Capacitance	5.00 nF	4.90 to 5.10 nF [EMU 23 pF]	4.92		Same
Diode Test: 3.5kOhm Input	2.0000 V	2.0000 to 3.1000 V [EMU 63 µV]	2.8900		Same
Diode Test: 0Ohm Input	0.0000 V	Pass/Fail	PASS		Same
Lo Ohm Test: REL offset	0.200 Ohm	0.180 to 0.220 Ohm [EMU 1.2 mOhm]	0.194		Same
@ 50 Ohm Range	50.000 Ohm	49.905 to 50.095 Ohm [EMU 2.9 mOhm]	50.001		Same
µA AC: 500µA Range	500.00 µA @ 60 Hz	496.80 to 503.20 µA [EMU 0.65 µA]	499.56		Same
|	500.00 µA @ 30 kHz	492.85 to 507.15 µA [EMU 5.6 µA]	498.08		Same
µA AC: 5000µA Range	5000.00 µA @ 30kHz	4928.50 to 5071.50 µA [EMU 24 µA]	4999.30		Same
µA DC: 500µA Range	500.00 µA	499.42 to 500.58 µA [EMU 0.1 µA]	500.01		Same
µA DC: 5000µA Range	5000.0 µA	4996.0 to 5004.0 µA [EMU 0.75 µA]	5000.3		Same
mA AC: 50mA Range	4.000 mA @ 20Hz	3.940 to 4.060 mA [EMU 5.6 µA]	3.979		Same
|	30.000 mA @ 30 kHz	29.375 to 30.625 mA [EMU 120 µA]	29.922		Same
mA AC: 400mA Range	300.00 mA @ 30kHz	284.60 to 315.40 mA [EMU 1.4 mA]	300.41		Same
|	400.00 mA @ 60Hz	397.55 to 402.45 mA [EMU 300 µA]	400.05		Same
mA DC: 50mA Range	0.100 mA	0.090 to 0.110 mA [EMU 0.58 µA]	0.098		Same
|	50.000 mA	49.965 to 50.035 mA [EMU 7.5 µA]	50.001		Same
mA DC: 400mA Range	400.00 mA	399.38 to 400.62 mA [EMU 120 µA]	399.97		Same
AAC: 5A Range	5.0000 A @ 1kHz	4.9580 to 5.0420 A [EMU 7 mA]	4.9983		Same
AAC: 10A Range	5.000 A @ 1 kHz	4.955 to 5.045 A [EMU 7 mA]	4.998		Same
ADC: 5A Range	5.0000 A	4.9840 to 5.0160 A [EMU 3 mA]	5.0001		Same
ADC: 10A Range	10.000 A	9.968 to 10.032 A [EMU 5.5 mA]	10.001		Same
LoZ: 1 kVolt Range	120.0 V @ 60Hz	113.6 to 126.4 V [EMU 63 mV]	120.2		Same
Temperature: Type K	0.0 °C	-1.0 to 1.0 °C [EMU 0.17 °C]	1.0		Same
|	100.0 °C	98.0 to 102.0 °C [EMU 0.17 °C]	101.5		Same

Test Number: 3019509 Asset Number: 267 Desc: Fluke / 289, Multimeter, Digital - Handheld

Calibration Data

FUNCTION TESTED	Nominal Value	CALIBRATION TOLERANCE	As Found	Out of Tol	As Left
|	1000.0 °C	989.0 to 1011.0 °C [EMU 0.27 °C]	1001.7		Same
Audible Tone from Length of Leads	25.0 Ohm	PASS/FAIL	PASS		Same

End Of Report

Applied Technical Services

Certificate of Calibration

Certificate #3019603

ACCREDITED
CALIBRATION CERT: #1888.03

Customer:
Southwire Company - D.B.Cofer
D.B.Cofer Technology Center
111 Development Drive
Carrollton, GA 30119

Calibration Location:
Southwire Company - D.B.Cofer
D.B.Cofer Technology Center
111 Development Drive
Carrollton, GA 30119

Instrument Information:

Manufacturer: Fluke
Model Number: 789
Description: Process Meter
Asset Number: 679
Serial Number: 25200003
PO Number: 4503214624

Calibration Information/Results:

As Found Condition : In Tolerance
Action Taken / As Left: In Tolerance - No Adjustment
Temperature: 73° F
Humidity: 53% RH
Calibration Date: 01-Jun-2021
Calibration Due Date: 01-Jun-2022
Calibration Interval: 12 Months

Calib. Procedure: ATS-1040 Rev 2:Calibration of Handheld Digital Multimeters

This instrument has been calibrated using primary or secondary standards whose calibration is traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST) or applicable ASTM specification number for hardness testing equipment. Some measurements are traceable to natural, physical constants, consensus standards, or ratio type measurements.
The reported expanded measurement uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a confidence level of approximately 95%. This calibration certificate may contain data that is not covered by the Scope of Accreditation. The unaccredited test points, where applicable, are indicated by an asterisk (*), or confined to clearly marked sections. Functional tests are not accredited. The expanded measurement uncertainty is not considered when determining in-tolerance or out-of-tolerance conditions. Results are reviewed, if applicable, to establish where any measurement results exceeded the stated calibration tolerance and to communicate results by means of this certificate.
All calibrations are performed in accordance with the ATS Quality Manual QM1, Rev. 18, dated 10/16/20. Applied Technical Services, Inc.'s Quality System complies with the applicable requirements of ANSI/NCSL Z540-1, ISO 9001:2015, 10CFR50 Appendix B, 10CFR Part 21, and ISO/IEC 17025:2017. The reported data is valid only at the time of the test and related only to the item calibrated. Calibration due dates appearing on this certificate and calibration label are determined by the client and do not imply continued conformance to specifications. This certificate shall not be reproduced except in full, without written permission of Applied Technical Services, Inc.

Technical Remarks:

Calibrated By: Taylor, Collin A (Name) — Calibration Tech (Title)

Calibration Equipment Utilized

Standard I.D.	Mfg.	Model No.	Description	Serial	Cal. Date	Due Date
ATS-04852	Fluke	5522A/1G	Calibrator, Multi-Function	2034901	02/03/2021	02/03/2022
ATS-4124	Agilent Technologies	34401A	Multimeter, Digital - Benchtop	3146A21255	10/07/2020	10/07/2021

Calibration Data

FUNCTION TESTED	Nominal Value	CALIBRATION TOLERANCE	As Found	Out of Tol	As Left
AC Voltage Accuracy: 400mV Range	100.0 mV @60Hz	98.9 to 101.1 mV [EMU 62 μV]	99.8		Same
|	300.0 mV @60Hz	297.5 to 302.5 mV [EMU 77 μV]	299.9		Same
4V Range	1.000 V @60Hz	0.991 to 1.009 V [EMU 610 μV]	0.999		Same
|	2.000 V @60Hz	1.984 to 2.016 V [EMU 680 μV]	1.998		Same
|	3.000 V @60Hz	2.977 to 3.023 V [EMU 770 μV]	2.999		Same
40V Range	10.00 V @60Hz	9.91 to 10.09 V [EMU 6.1 mV]	9.99		Same
|	30.00 V @60Hz	29.77 to 30.23 V [EMU 7.7 mV]	29.99		Same
400V Range	100.0 V @60Hz	99.1 to 100.9 V [EMU 61 mV]	99.9		Same
|	300.0 V @60Hz	297.7 to 302.3 V [EMU 83 mV]	299.9		Same

Calibration Data

FUNCTION TESTED	Nominal Value	CALIBRATION TOLERANCE	As Found	Out of Tol	As Left
1000V Range	100 V @60Hz	97 to 103 V [EMU 580 mV]	100		Same
|	800 V @60Hz	792 to 808 V [EMU 630 mV]	801		Same
Frequency Accuracy: 199.99 Hz Range	100.00 Hz @ 5 V	99.99 to 100.01 Hz [EMU 5.8 mHz]	100.00		Same
1999.9 Hz Range	1000.0 Hz @ 5 V	999.9 to 1000.1 Hz [EMU 58 mHz]	1000.0		Same
19.999 kHz Range	10.000 kHz @ 5 V	9.999 to 10.001 kHz [EMU 0.58 Hz]	10.000		Same
DC Voltage Accuracy: 4 V Range	1.000 V	0.998 to 1.002 V [EMU 580 µV]	1.000		Same
|	3.000 V	2.996 to 3.004 V [EMU 580 µV]	3.000		Same
40 V Range	10.00 V	9.98 to 10.02 V [EMU 5.8 mV]	10.00		Same
|	30.00 V	29.96 to 30.04 V [EMU 5.8 mV]	30.00		Same
400 V Range	100.0 V	99.8 to 100.2 V [EMU 58 mV]	100.0		Same
|	300.0 V	299.6 to 300.4 V [EMU 58 mV]	300.0		Same
1000 V Range	100 V	99 to 101 V [EMU 580 mV]	100		Same
|	800 V	798 to 802 V [EMU 580 mV]	800		Same
400 mV Range	100.0 mV	99.7 to 100.3 mV [EMU 58 µV]	100.1		Same
|	300.0 mV	299.5 to 300.5 mV [EMU 58 µV]	300.0		Same
Resistance Accuracy: 400 Ohm Range	120.0 Ohm	119.6 to 120.4 Ohm [EMU 58 mOhm]	120.0		Same
|	300.0 Ohm	299.2 to 300.8 Ohm [EMU 59 mOhm]	300.0		Same
4 kOhm Range	1.200 kOhm	1.197 to 1.203 kOhm [EMU 580 mOhm]	1.200		Same
|	3.000 kOhm	2.993 to 3.007 kOhm [EMU 590 mOhm]	3.000		Same
40 kOhm Range	12.00 kOhm	11.97 to 12.03 kOhm [EMU 5.8 Ohm]	12.00		Same
|	30.00 kOhm	29.93 to 30.07 kOhm [EMU 5.9 Ohm]	29.99		Same
400 kOhm Range	120.0 kOhm	119.7 to 120.3 kOhm [EMU 58 Ohm]	120.0		Same
|	200.0 kOhm	199.5 to 200.5 kOhm [EMU 58 Ohm]	200.0		Same
4 MOhm Range	1.200 MOhm	1.193 to 1.207 MOhm [EMU 0.59 kOhm]	1.200		Same
|	3.000 MOhm	2.987 to 3.013 MOhm [EMU 0.61 kOhm]	2.999		Same
40 MOhm Range	12.00 MOhm	11.67 to 12.33 MOhm [EMU 8 kOhm]	12.00		Same
|	30.00 MOhm	29.22 to 30.78 MOhm [EMU 12 kOhm]	30.00		Same
DC Current Accuracy: 30 mA Range	4.000 mA	3.996 to 4.004 mA [EMU 0.87 µA]	4.000		Same
|	12.000 mA	11.992 to 12.008 mA [EMU 1.6 µA]	12.000		Same
|	20.000 mA	19.988 to 20.012 mA [EMU 2.3 µA]	19.999		Same
1 A Range	0.100 A	0.098 to 0.102 A [EMU 580 µA]	0.100		Same
|	0.400 A	0.398 to 0.402 A [EMU 590 µA]	0.400		Same
AC Current Accuracy: 1 A Range	0.100 A @ 60 Hz	0.097 to 0.103 A [EMU 580 µA]	0.100		Same
|	0.400 A @ 60 Hz	0.394 to 0.406 A [EMU 650 µA]	0.401		Same
Current Source: DC mA Test	4.000 mA	3.996 to 4.004 mA [EMU 0.59 µA]	3.999		Same
|	12.000 mA	11.992 to 12.008 mA [EMU 1.1 µA]	11.999		Same
|	20.000 mA	19.988 to 20.012 mA [EMU 1.3 µA]	20.000		Same
Loop Power	>30 V	Pass / Fail	PASS		Same
250 Ohm Button	>24 V	Pass / Fail	PASS		Same
Diode Test	2.000 V	1.959 to 2.041 V [EMU 580 µV]	1.999		Same
Continuity Test Beeper On	120 Ohm	Pass Fail	PASS		Same
Beeper Off	240 Ohm	Pass Fail	PASS		Same

End Of Report

Appendix B: Pictures

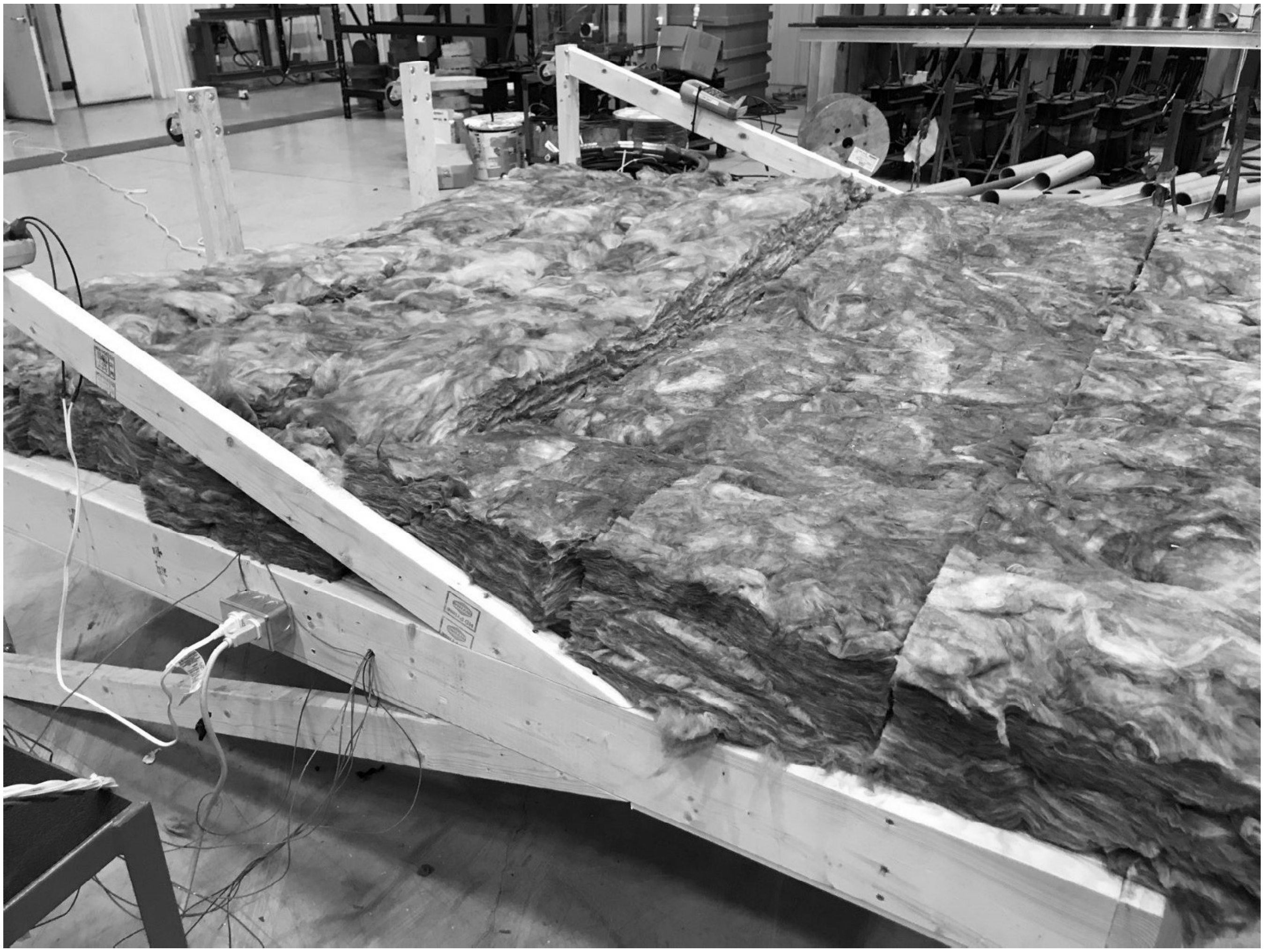


Figure B.1: Apparatus in Ceiling Configuration with Insulation

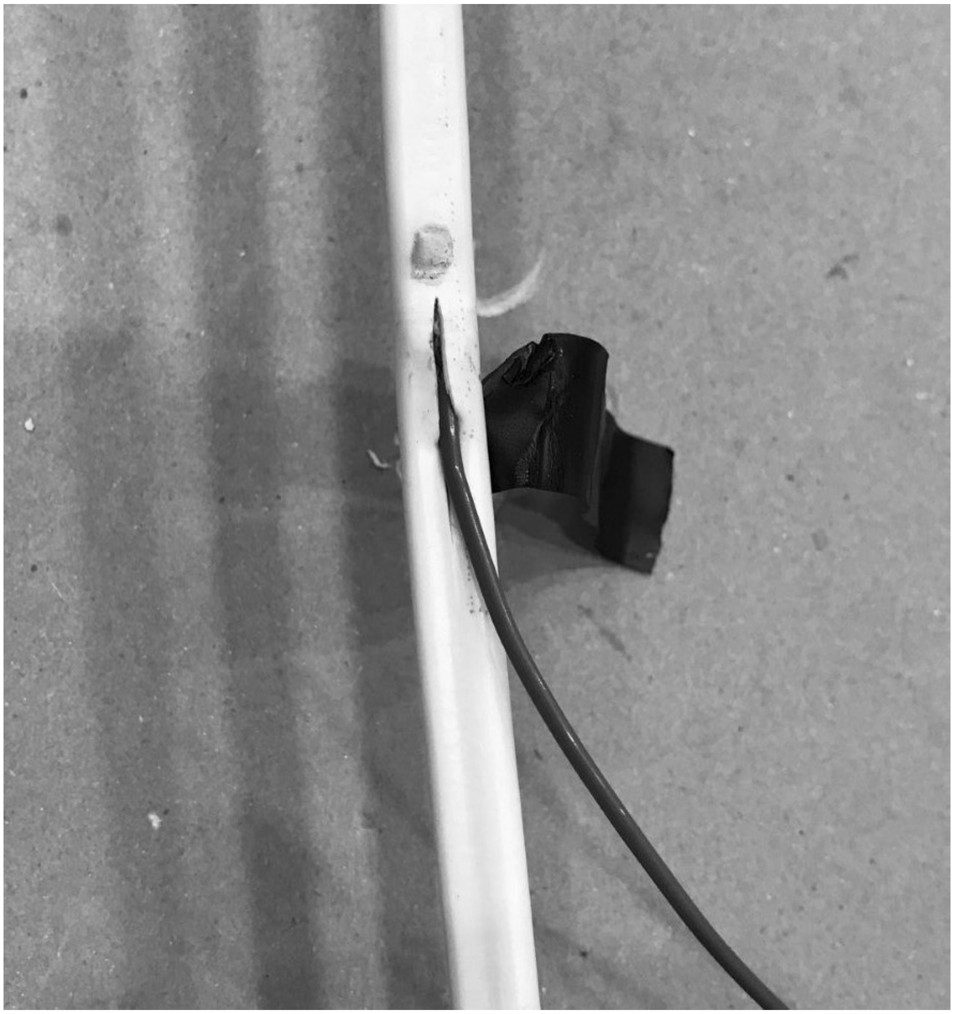


Figure B.2: Thermocouple Installed in NM-B Sample

Figure B.3: Thermocouple Installed in NM-B Sample

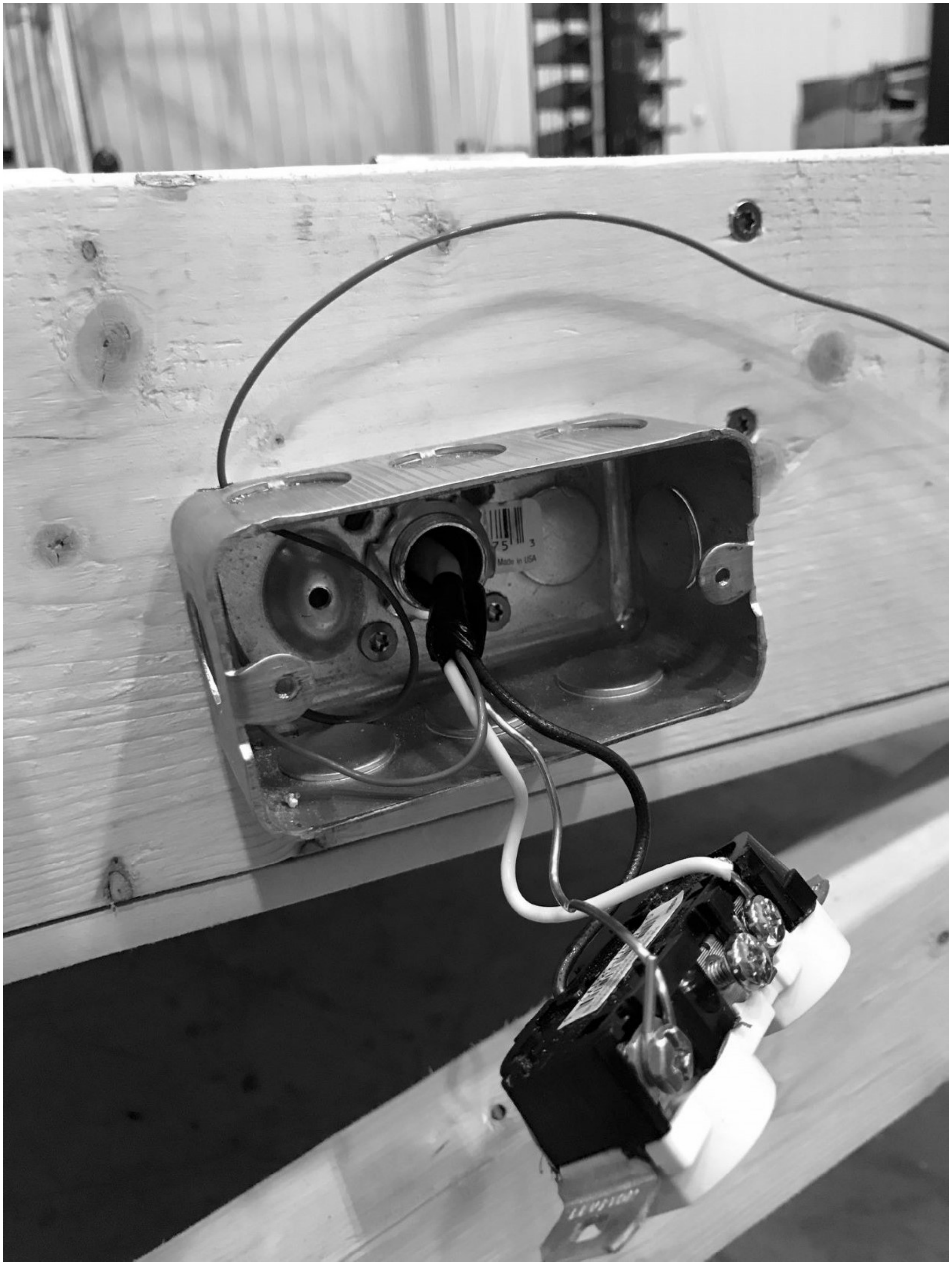


Figure B.4: Thermocouple Installed in Electrical Box

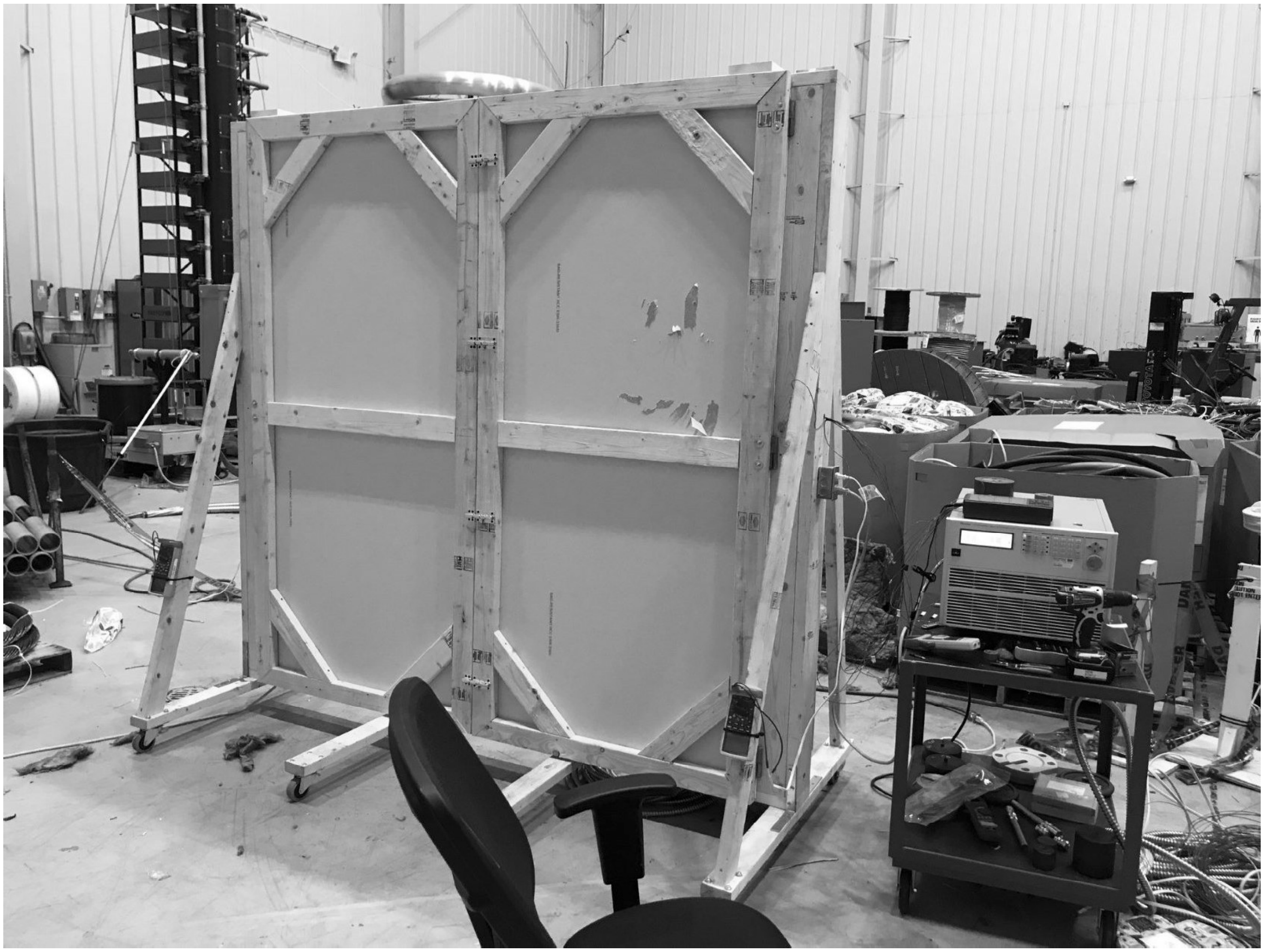


Figure B.5: Apparatus in Wall Configuration with Sheetrock Doors Closed

Figure B.6: Flexible Metal Conduit Installed in Apparatus

Figure B.7: Breaker Box

Figure B.8: Ampmeter, Data Logger, and Load Bank

Figure B.9: NM-B Sample Installed in Apparatus in Ceiling Configuration

Public Comment No. 1816-NFPA 70-2021 [Section No. 210.24]

210.24 Branch-Circuit Requirements — Summary.

The requirements for circuits that have two or more outlets or receptacles, other than the receptacle circuits of 210.11(C)(1), (C)(2), ~~and~~ (C)(3), and 625.44, are summarized in Table 210.24(a) for copper conductors and Table 210.24(b) for aluminum and copper-clad aluminum conductors. Table 210.24(a) and Table 210.24(b) provide only a summary of minimum requirements. See 210.19, 210.20, and 210.21 for the specific requirements applying to branch circuits.

Table 210.24(a) Summary of Branch-Circuit Requirements — Copper Conductors

Circuit Rating	10 A	15 A	20 A	30 A	40 A	50 A	
Conductors (min. size):	–	–	–				cc - -
Circuit wires[1]	14	14	12	10	8	6	
Taps	14	14	14	14	12	12	
Fixture wires and cords			See 240.5.	–	–	–	
Overcurrent Protection	**10 A**	**15 A**	**20 A**	**30 A**	**40 A**	**50 A**	
Outlet devices:	–	–	–	–	–	–	
Lampholders permitted	Any type	Any type	Any type	Heavy duty	Heavy duty	Heavy duty	
Receptacle rating[2]	See note 2.	15 max. A	15 A or 20 A	30 A	40 A or 50 A	50 A	
Maximum Load	**10 A**	**15 A**	**20 A**	**30 A**	**40 A**	**50 A**	
Permissible load	See 210.23(A).	See 210.23(B).	See 210.23(B).	See 210.23(C).	See 210.23(D).	See 210.23(D).	

[1]For receptacle rating of cord-connected electric-discharge luminaires, see 410.62(C).

[2]Branch circuits rated 10-amperes shall not be permitted to supply receptacles.

Table 210.24(b) Summary of Branch-Circuit Requirements — Aluminum and Copper-Clad Aluminum Conductors

Circuit Rating	10 A[1]	15 A	20 A	30 A	40 A	50 A	
Conductors (min. size):	–	–	–	–	–	–	
Circuit wires	14[1]	12	10	8	6	4	
Taps	14[1]	12	12	12	10	10	
Fixture wires and cords	–	–	–				See 240.5. - -
Overcurrent Protection	**10 A[1]**	**15 A**	**20 A**	**30 A**	**40 A**	**50 A**	
Outlet devices:	–	–	–	–	–	–	
Lampholders permitted	Any type	Any type	Any type	Heavy duty	Heavy duty	Heavy duty	
Receptacle rating[2]	See note 3.	15 max. A	15 A or 20 A	30 A	40 A or 50 A	50 A	
Maximum Load	**10 A[1]**	**15 A**	**20 A**	**30 A**	**40 A**	**50 A**	
Permissible load	See 210.23(A).	See 210.23(B).	See 210.23(B).	See 210.23(C).	See 210.23(D).	See 210.23(D).	

[1]Copper-clad aluminum conductors only.

[2]For receptacle rating of cord-connected electric-discharge luminaires, see 410.62(C).

[3]Branch circuits rated 10-amperes shall not be permitted to supply receptacles.

Statement of Problem and Substantiation for Public Comment

In order to facilitate EV-Ready installations for shared parking, and avoid requiring an electrician to install an EVSE each time an EV-Ready outlet is activated, we are proposing to permit 50 A receptacles and 80 A branch circuits subject to conditions proposed in parallel to 210.21, 625.40, 41, 42, 44, etc., since our Flex unit is already listed for 50 A output and an 80 A branch circuit. Thus we're proposing a revision to this rule to effectively except EV-Ready type outlets from this table subject to compliance with other articles we're proposing revisions for that require limited ratings, labeling, etc., to ensure safety. We are also proposing allowing 14-60R type receptacles since they are recognized within the NEC and some of the latest EVs, like the Lucid Air, are capable of using more than 50 A.

Related Item

- PI-3746 proposed adding 14-60R
- FR-9099 rejected addition of 60 A recetpacles since article 3 only applies to receptacles of 50 A or
- PC-1803 proposes exception for 50 A output / receptacle for 80 A branch circuit subject to suitable listing and receptacle
- PC-2020 proposes sizing overcurrent for EVSE recognizing maximum overcurrent rating, restricted access adjustment, or load
- PC-2025 proposes permitting 14-60R for portable equipment
- PC-2026 proposes allowing 14-60R for fastened-in-place equipment

less.	labeling..	management

Submitter Information Verification

Submitter Full Name:	Kevin Cheong
Organization:	ChargePoint Inc.
Affiliation:	ChargePoint Inc.
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Aug 18 00:33:13 EDT 2021
Committee:	NEC-P02

Public Comment No. 54-NFPA 70-2021 [Section No. 210.24]

210.24 Branch-Circuit Requirements — Summary.

The requirements for circuits that have two or more outlets or receptacles, other than the receptacle circuits of 210.11(C)(1), (C)(2), and (C)(3), are summarized in Table 210.24(a) for copper conductors and Table 210.24(b) for aluminum and copper-clad aluminum conductors. Table 210.24(a) and Table 210.24(b) provide only a summary of minimum requirements. See 210.19, 210.20, and 210.21 for the specific requirements applying to branch circuits.

Table 210.24(a) Summary of Branch-Circuit Requirements — Copper Conductors

Circuit Rating	10 A	15 A	20 A	30 A	40 A	50 A	
Conductors (min. size):	–	–	–				cc - -
Circuit wires[1]	~~14~~ 16	14	12	10	8	6	
Taps	~~14~~ 16	14	14	14	12	12	
Fixture wires and cords			See 240.5.	–	–	–	
Overcurrent Protection	**10 A**	**15 A**	**20 A**	**30 A**	**40 A**	**50 A**	
Outlet devices:	–	–	–	–	–	–	
Lampholders permitted	Any type	Any type	Any type	Heavy duty	Heavy duty	Heavy duty	
Receptacle rating[2]	See note 2.	15 max. A	15 A or 20 A	30 A	40 A or 50 A	50 A	
Maximum Load	**10 A**	**15 A**	**20 A**	**30 A**	**40 A**	**50 A**	
Permissible load	See 210.23(A).	See 210.23(B).	See 210.23(B).	See 210.23(C).	See 210.23(D).	See 210.23(D).	

[1]For receptacle rating of cord-connected electric-discharge luminaires, see 410.62(C).

[2]Branch circuits rated 10-amperes shall not be permitted to supply receptacles.

Table 210.24(b) Summary of Branch-Circuit Requirements — Aluminum and Copper-Clad Aluminum Conductors

Circuit Rating	10 A[1]	15 A	20 A	30 A	40 A	50 A	
Conductors (min. size):	–	–	–	–	–	–	
Circuit wires	14[1]	12	10	8	6	4	
Taps	14[1]	12	12	12	10	10	
Fixture wires and cords	–	–	–				See 240.5. - -
Overcurrent Protection	**10 A[1]**	**15 A**	**20 A**	**30 A**	**40 A**	**50 A**	
Outlet devices:	–	–	–	–	–	–	
Lampholders permitted	Any type	Any type	Any type	Heavy duty	Heavy duty	Heavy duty	
Receptacle rating[2]	See note 3.	15 max. A	15 A or 20 A	30 A	40 A or 50 A	50 A	
Maximum Load	**10 A[1]**	**15 A**	**20 A**	**30 A**	**40 A**	**50 A**	
Permissible load	See 210.23(A).	See 210.23(B).	See 210.23(B).	See 210.23(C).	See 210.23(D).	See 210.23(D).	

[1]Copper-clad aluminum conductors only.

[2]For receptacle rating of cord-connected electric-discharge luminaires, see 410.62(C).

[3]Branch circuits rated 10-amperes shall not be permitted to supply receptacles.

Statement of Problem and Substantiation for Public Comment

240.4(D)(2) allows 16AWG Copper for a 10 amp circuit, there is no data to substantiate the need for an increase of the required conductor size.

Related Item

• 3940-NFPA 70-2020

Submitter Information Verification

Submitter Full Name: Stephen Schmiechen
Organization: [Not Specified]
Street Address:

City:	
State:	
Zip:	
Submittal Date:	Thu Jul 01 00:52:01 EDT 2021
Committee:	NEC-P02

Public Comment No. 1258-NFPA 70-2021 [Section No. 210.52(A)(2)]

(2) Wall Space.

As used in this section, a wall space shall include the following:

(1) Any space 600 mm (2 ft) or more in width (including space measured around corners) and unbroken along the floor line by doorways~~ and similar openings~~ , fireplaces, ~~stationary appliances, ~~ and ~~fixed cabinets that do not have countertops or similar work surfaces~~ similar openings.

(2) The space occupied by fixed panels in walls, excluding sliding panels

(3) The space afforded by fixed room dividers, such as freestanding bar-type counters or railings

Statement of Problem and Substantiation for Public Comment

The position of a stationary appliance can change, or the appliance could disappear entirely with a change in ownership and/or occupant. A stationary appliance includes a wide variety of appliances, including many that do not live in cabinet space cut-outs.This will be a nightmare to enforce. Remember that final electrical inspections generally take place before such appliances are put in place because they must precede the issuance of a certificate of occupancy. The substantiation for PI-27 correctly identifies a problem, but it is yet another classic example of the inherent absurdity of attempting to disqualify countertop receptacles from inclusion in 210.52(A)(2). If those receptacles are included, then the problem of a missing receptacle in a stove cut-out disappears.

This comment resurrects PI 3558 and solve this problem entirely. It also vastly increases safety. The cabinetry exclusion can and is routinely being applied, especially in high end construction, where entire rooms are being build with ornate wood cabinetry on all four walls. Under the literal text of current code, these rooms do not require so much as a single receptacle outlet. In seminars, I use a photo taken in one of these rooms by the business owner, who is making a fine living constructing such wall finishes. The photo includes a small desk in the center of the room with its light plugged into a floor receptacle. Now, that receptacle is over and above current NEC minimums; it was installed as a design constraint at the request of the property owner. According to CMP 2, we are all going to die if we count counter receptacles in 210.52(A), but it is just ducky to have an entire room serviced by extension cords run through a doorway.

This ongoing panel position is utterly preposterous. Meanwhile, in Massachusetts, we move merrily along with the 2008 NEC wording remaining in place, with no observable loss experience. We will not be changing this anytime soon. And, our inspection community has no problem insisting on normal receptacle spacings in habitable rooms, even those with all wood cabinetry, and we also don't have issues with receptacles being required in appliance cutouts. It is also important to remember that the cabinetry exclusion was never substantiated. Never. What passed for substantiation a simple observation that the literal text of the Code allowed counter wall receptacles to qualify as 210.52(A) receptacles. That was it. Not an iota of loss experience or engineering judgement, and CMP 2 caved. Now, seemingly with egos involved we soldier on. Enough. This FR is just the latest bandage that creates more inadvertent problems, and all because the root problem festers. Note that if this approach is accepted, correlating action will be required to delete 210.52(A)(4) and the equivalent language for countertops.

Related Item

• FR-9110 • PI-3558

Submitter Information Verification

Submitter Full Name: Frederic Hartwell

Organization: Hartwell Electrical Services, Inc.

Street Address:

City:

State:

Zip:

Submittal Date: Wed Aug 11 14:05:31 EDT 2021

Committee: NEC-P02

Public Comment No. 1304-NFPA 70-2021 [Section No. 210.52(A)(2)]

(2) Wall Space.

As used in this section, a wall space shall include the following:

(1) Any space 600 mm (2 ft) or more in width (including space measured around corners) and unbroken along the floor line by doorways and similar openings, fireplaces, ~~stationary~~ fixed appliances, and fixed cabinets that do not have countertops or similar work surfaces

(2) The space occupied by fixed panels in walls, excluding sliding panels

(3) The space afforded by fixed room dividers, such as freestanding bar-type counters or railings

Statement of Problem and Substantiation for Public Comment

"Fixed appliance" is defined in Article 100, but stationary is not.

Related Item

• FR 9110

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Ryan Jackson
Street Address:
City:
State:
Zip:

Submittal Date: Wed Aug 11 16:43:13 EDT 2021
Committee: NEC-P02

Public Comment No. 660-NFPA 70-2021 [Section No. 210.52(C)]

(C) Countertops and Work Surfaces.

In kitchens, pantries, breakfast rooms, dining rooms, and similar areas of dwelling units, receptacle outlets for countertop and work surfaces that are 300 mm (12 in.) or wider shall be installed in accordance with 210.52(C)(1) through (C)(4) and shall not be considered as the receptacle outlets required by 210.52(A).

(1)

For the purposes of this section, receptacles installed in accordance with either of the following shall be considered as one receptacle outlet:

(1) Each 300 mm (12 in.) of multioutlet assembly containing two or more receptacles installed in individual or continuous lengths

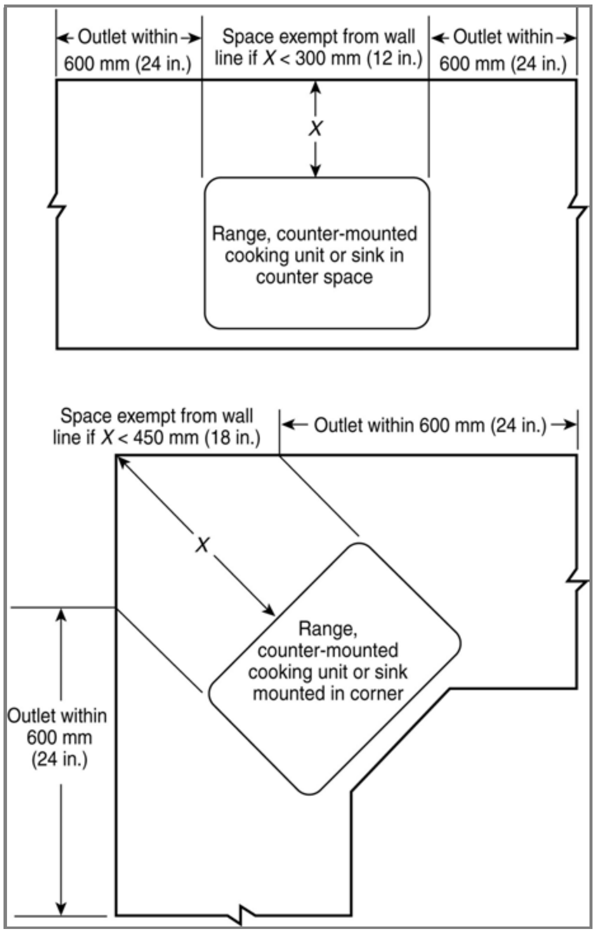
(2) Each two receptacles installed in the same device box

(2) Wall Spaces.

Receptacle outlets shall be installed so that no point along the wall line is more than 600 mm (24 in.) measured horizontally from a receptacle outlet in that space.

Exception: Receptacle outlets shall not be required directly behind a range, counter-mounted cooking unit, or sink in the installation described in Figure 210.52(C)(2).

Figure 210.52(C)(2) Determination of Area Behind a Range, Counter-Mounted Cooking Unit, or Sink.



(3) Island and Peninsular Countertops and Work Surfaces.

Receptacle outlets shall be installed in accordance with 210.52(C)(3)(a) and (C)(3)(b).

(a) *Locations with Countertop or Work Surface Wall Spaces.* At least one receptacle outlet shall be installed where the location is also provided with countertops or work surfaces totaling more than 1.2 linear m (4 linear ft).

(b) *Locations without Countertop or Work Surface Wall Spaces*. Receptacle outlets shall be installed in accordance with one of the following. Receptacle outlets shall be permitted to be located as determined by the installer, designer, or building owner.

(1) At least one receptacle outlet shall be provided for the first 0.84 m^2 (9 ft^2), or fraction thereof, of the countertop or work surface. A receptacle outlet shall be provided for every additional 1.7 m^2 (18 ft^2), or fraction thereof, of the countertop or work surface. Sinks, cooktops, or similar shall not be included in the measurement.

(2) At least one receptacle outlet shall be located within 600 mm (2 ft) of the outer end of a peninsular countertop or work surface.

Where a peninsular countertop is connected to a wall countertop, the peninsular countertop shall be measured from the connected wall countertop. Where a peninsular countertop is connected to a wall, the peninsular countertop shall be measured from the wall.

(4) Receptacle Outlet Location.

Receptacle outlets shall be located in one or more of the following:

(1) On or above countertop or work surfaces: On or above, but not more than 500 mm (20 in.) above, countertops or work surfaces.

(2) In countertop or work surfaces: Receptacle outlet assemblies listed for use in countertops or work surfaces shall be permitted to be installed in countertops or work surfaces.

(3) Below countertop or works surfaces: Not more than 300 mm (12 in.) below countertops or work surfaces. Receptacles installed below a countertop or work surface shall not be located where the countertop or work surface extends more than 150 mm (6 in.) beyond the face of such receptacles.

Receptacle outlets rendered not readily accessible by appliances fastened in place, appliance garages, sinks, or rangetops as covered in 210.52(C)(2), Exception, or appliances occupying assigned spaces shall not be considered as these required outlets.

Informational Note No. 1: See 406.5(E) and 406.5(G) for installation of receptacles in countertops and 406.5(F) and 406.5(G) for installation of receptacles in work surfaces. See 380.10 for installation of multioutlet assemblies.

Informational Note No. 2: See Annex J and ANSI/ICC A117.1-2009, *Standard on Accessible and Usable Buildings and Facilities*.

Additional Proposed Changes

File Name	Description	Approved
2_CN_121_Detail.pdf	2 CN121	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 121 appeared in the First Draft Report on First Revision No. 9130.

The Correlating Committee notes that the word "Additional" was left out of the second sentence and this language needs to be reconsidered by the Panel.

Related Item

• First Revision No. 9130

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 03 08:34:11 EDT 2021
Committee: NEC-P02

Correlating Committee Note No. 121-NFPA 70-2021 [Detail]

Submitter Information Verification

Committee: NEC-P02
Submittal Date: Tue May 04 14:33:56 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee notes that the word "Additional" was left out of the second sentence and this language needs to be reconsidered by the Panel.

First Revision No. 9130-NFPA 70-2021 [Detail]

Ballot Results

✔ **This item has passed ballot**

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

Affirmative All

Ayer, Lawrence S.
Gallo, Ernest J.
Hickman, Palmer L.
Holub, Richard A.
Hunter, Dean C.
Johnston, Michael J.
Kendall, David H.
Kovacik, John R.
Manche, Alan
McDaniel, Roger D.
Porter, Christine T.
Williams, David A.

Public Comment No. 661-NFPA 70-2021 [Section No. 210.52(C)]

(C) Countertops and Work Surfaces.

In kitchens, pantries, breakfast rooms, dining rooms, and similar areas of dwelling units, receptacle outlets for countertop and work surfaces that are 300 mm (12 in.) or wider shall be installed in accordance with 210.52(C)(1) through (C)(4) and shall not be considered as the receptacle outlets required by 210.52(A).

(1)

For the purposes of this section, receptacles installed in accordance with either of the following shall be considered as one receptacle outlet:

(1) Each 300 mm (12 in.) of multioutlet assembly containing two or more receptacles installed in individual or continuous lengths

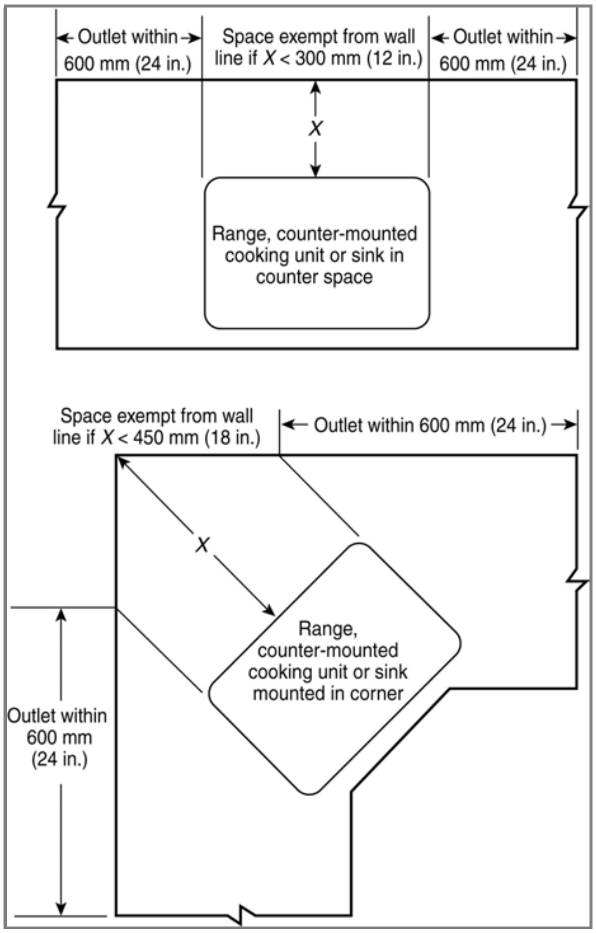
(2) Each two receptacles installed in the same device box

(2) Wall Spaces.

Receptacle outlets shall be installed so that no point along the wall line is more than 600 mm (24 in.) measured horizontally from a receptacle outlet in that space.

Exception: Receptacle outlets shall not be required directly behind a range, counter-mounted cooking unit, or sink in the installation described in Figure 210.52(C)(2).

Figure 210.52(C)(2) Determination of Area Behind a Range, Counter-Mounted Cooking Unit, or Sink.



(3) Island and Peninsular Countertops and Work Surfaces.

Receptacle outlets shall be installed in accordance with 210.52(C)(3)(a) and (C)(3)(b).

(a) *Locations with Countertop or Work Surface Wall Spaces.* At least one receptacle outlet shall be installed where the location is also provided with countertops or work surfaces totaling more than 1.2 linear m (4 linear ft).

(b) *Locations without Countertop or Work Surface Wall Spaces*. Receptacle outlets shall be installed in accordance with one of the following. Receptacle outlets shall be permitted to be located as determined by the installer, designer, or building owner.

(1) At least one receptacle outlet shall be provided for the first 0.84 m^2 (9 ft^2), or fraction thereof, of the countertop or work surface. A receptacle outlet shall be provided for every additional 1.7 m^2 (18 ft^2), or fraction thereof, of the countertop or work surface. Sinks, cooktops, or similar shall not be included in the measurement.

(2) At least one receptacle outlet shall be located within 600 mm (2 ft) of the outer end of a peninsular countertop or work surface.

Where a peninsular countertop is connected to a wall countertop, the peninsular countertop shall be measured from the connected wall countertop. Where a peninsular countertop is connected to a wall, the peninsular countertop shall be measured from the wall.

(4) Receptacle Outlet Location.

Receptacle outlets shall be located in one or more of the following:

(1) On or above countertop or work surfaces: On or above, but not more than 500 mm (20 in.) above, countertops or work surfaces.

(2) In countertop or work surfaces: Receptacle outlet assemblies listed for use in countertops or work surfaces shall be permitted to be installed in countertops or work surfaces.

(3) Below countertop or works surfaces: Not more than 300 mm (12 in.) below countertops or work surfaces. Receptacles installed below a countertop or work surface shall not be located where the countertop or work surface extends more than 150 mm (6 in.) beyond the face of such receptacles.

Receptacle outlets rendered not readily accessible by appliances fastened in place, appliance garages, sinks, or rangetops as covered in 210.52(C)(2), Exception, or appliances occupying assigned spaces shall not be considered as these required outlets.

Informational Note No. 1: See 406.5(E) and 406.5(G) for installation of receptacles in countertops and 406.5(F) and 406.5(G) for installation of receptacles in work surfaces. See 380.10 for installation of multioutlet assemblies.

Informational Note No. 2: See Annex J and ANSI/ICC A117.1-2009, *Standard on Accessible and Usable Buildings and Facilities*.

Additional Proposed Changes

File Name	Description	Approved
2_CN_122_Detail.pdf	2 CN122	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 122 appeared in the First Draft Report on First Revision No. 9138.

The Correlating Committee directs that the Informational Note No.2: be revised to add the word "Informative" after the word "See" to comply with the NEC Style Manual Section 4.1.3.

Related Item

• First Revision No. 9138

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 03 08:38:54 EDT 2021
Committee: NEC-P02

Correlating Committee Note No. 122-NFPA 70-2021 [Detail]

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Tue May 04 14:37:06 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs that the Informational Note No.2: be revised to add the word "Informative" after the word "See" to comply with the NEC Style Manual Section 4.1.3.

First Revision No. 9138-NFPA 70-2021 [Detail]

Ballot Results

This item has passed ballot

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

Affirmative All

Ayer, Lawrence S.
Gallo, Ernest J.
Hickman, Palmer L.
Holub, Richard A.
Hunter, Dean C.
Johnston, Michael J.
Kendall, David H.
Kovacik, John R.
Manche, Alan
McDaniel, Roger D.
Porter, Christine T.
Williams, David A.

Public Comment No. 1305-NFPA 70-2021 [Section No. 210.52(C)(1)]

(1)

For the purposes of this section, receptacles installed in accordance with either of the following shall be considered as one receptacle outlet:

(1) Each 300 mm (12 in.) of multioutlet assembly containing two or more receptacles installed in individual or continuous lengths

(2) Each two receptacles installed in the same ~~device~~ outlet box

Statement of Problem and Substantiation for Public Comment

A device box is a very specific type of box, and it does not include a 4" x 4" metal box. See Table 314.16(A).

Related Item

- FR 9121

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Ryan Jackson
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 11 16:45:14 EDT 2021
Committee: NEC-P02

Public Comment No. 1525-NFPA 70-2021 [Section No. 210.52(C)(1)]

(1)

For the purposes of this section, receptacles installed in accordance with either of the following shall be considered as one receptacle outlet:

(1) Each 300 mm (12 in.) of multioutlet assembly containing two or more receptacles installed in individual or continuous lengths

(2) Each ~~two receptacles installed in the same~~ receptacle device yoke installed in a device box

Statement of Problem and Substantiation for Public Comment

This comment is being submitted on behalf of the Minnesota Department of Labor and Industry. The Department's 15 office/field staff, and 70 contract electrical inspectors complete over 150,000 electrical inspections annually.

Further clarification is required as to what is meant by "Each two receptacles installed in the same device box". A code enforcer has always viewed a single device box with a single or duplex receptacle installed as "one" receptacle outlet. A two-gang box installed with two receptacle devices, single or duplex, was considered "two" receptacle outlets. Making reference to the yoke, makes it clear that it doesn't matter how many receptacles are on the yoke or device strap, and each opening in a device box is considered one receptacle outlet when counting the number of receptacles.

Related Item

- FR 9121

Submitter Information Verification

Submitter Full Name: Dean Hunter

Organization: Minnesota Department of Labor

Street Address:

City:

State:

Zip:

Submittal Date: Mon Aug 16 10:42:02 EDT 2021

Committee: NEC-P02

Public Comment No. 2040-NFPA 70-2021 [Section No. 210.52(C)(1)]

(1)

For the purposes of this section, receptacles installed in accordance with either of the following shall be considered as one receptacle outlet:

(1) Each 300 mm (12 in.) of multioutlet assembly containing two or more receptacles installed in individual or continuous lengths

(2) ~~Each two~~ Two or more receptacles installed in the same device box

Statement of Problem and Substantiation for Public Comment

The proposed text in the First Draft at 210.52(C)(1)(2) is confusing. Why not simply match the Code language of the definition of a receptacle outlet found in Article 100? As proposed in the First Draft, a quadruplex configuration of (4) receptacles installed in a single outlet box would be considered something other than a single receptacle outlet (contrary to the definition of a "Receptacle Outlet" in Article 100).

Related Item

• FR 9121 • PI 567

Submitter Information Verification

Submitter Full Name: L. Keith Lofland
Organization: IAEI
Affiliation: None
Street Address:
City:
State:
Zip:

Submittal Date: Thu Aug 19 09:28:03 EDT 2021
Committee: NEC-P02

Public Comment No. 1097-NFPA 70-2021 [Sections 210.52(C)(2), 210.52(C)(3), 210.52(C)(4)]

Sections 210.52(C)(2), 210.52(C)(3), 210.52(C)(4)

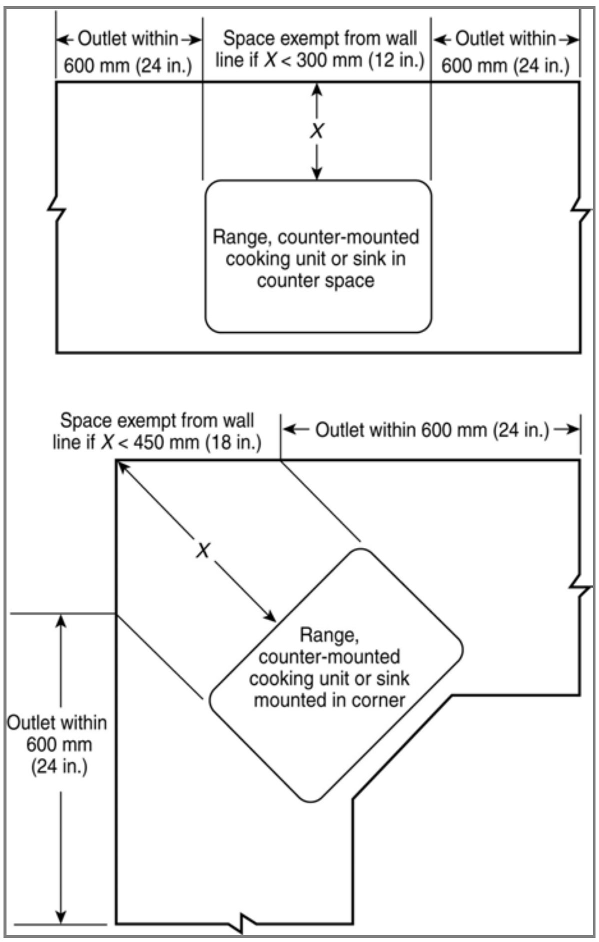
(2) Wall Spaces.

Receptacle outlets shall be installed so that no point along the wall line is more than 600 mm (24 in.) measured horizontally from a receptacle outlet in that space.The location of the receptacles shall be in accordance with 210.52(C)(4)(1) or 210.52(C)(4)2

Exception: Receptacle outlets shall not be required directly behind a range, counter-mounted cooking unit, or sink in the installation described in Figure 210.52(C)(2).

Exception No. 2 Where a required receptacle outlet cannot be installed in the wall areas shown in Figure 210.52(C)(2), the receptacle outlet shall be permitted to be installed as close as practicable to the countertop area to be served. The total number of receptacle outlets serving the countertop shall not be less than those required in 210.52(C)(2). These outlets shall be installed in accordance with 210.52(C)4(1) or 210.52(C)4(2).

Figure 210.52(C)(2) Determination of Area Behind a Range, Counter-Mounted Cooking Unit, or Sink.



(3) Island and Peninsular Countertops and Work Surfaces.

Receptacle outlets shall be permitted to be installed in accordance with 210.52(C)(~~3~~ 4)(~~a~~ 1) ~~and~~ or (C)(~~3)(b).~~ ~~*Locations with Countertop or Work Surface Wall Spaces.*~~ ~~At least one receptacle outlet shall be installed where the location is also provided with countertops or work surfaces totaling more than 1.2 linear m (4 linear ft) . *Locations without Countertop or Work Surface Wall Spaces* . Receptacle outlets shall be installed in accordance with one of the following. Receptacle outlets shall be permitted to be located as determined by the installer, designer, or building owner. At least one receptacle outlet shall be provided for the first 0.84 m² (9 ft 2) , or fraction thereof, of the countertop or work surface . A receptacle outlet shall be provided for every additional 1.7 m² (18 ft²), or fraction thereof, of the countertop or work surface. Sinks, cooktops, or similar shall not be included in the measurement.~~ ~~At least one receptacle outlet shall be located within 600 mm~~

~~(~~

~~2 ft) of the outer end of a peninsular countertop or work surface.~~

~~Where a peninsular countertop is connected to a wall countertop, the peninsular countertop shall be measured from the connected wall countertop. Where a peninsular countertop is connected to a wall, the peninsular countertop shall be measured from the wall.~~

(4) Receptacle Outlet Location.

Receptacle outlets shall be located in one or more of the following:

(1) On or above countertop or work surfaces: On or above, but not more than 500 mm (20 in.) above, countertops or work surfaces.

(2) In countertop or work surfaces: Receptacle outlet assemblies listed for use in countertops or work surfaces shall be permitted to be installed in countertops or work surfaces.

(3) ~~Below countertop or works surfaces: Not more than 300 mm (12 in.) below countertops or work surfaces. Receptacles installed below a countertop or work surface shall not be located where the countertop or work surface extends more than 150 mm (6 in.) beyond the face of such receptacles.~~

Receptacle outlets rendered not readily accessible by appliances fastened in place, appliance garages, sinks, or rangetops as covered in 210.52(C)(2), Exception, or appliances occupying assigned spaces shall not be considered as these required outlets.

Informational Note No. 1: See 406.5(E) and 406.5(G) for installation of receptacles in countertops and 406.5(F) and 406.5(G) for installation of receptacles in work surfaces. See 380.10 for installation of multioutlet assemblies.

Informational Note No. 2: See Annex J and ANSI/ICC A117.1-2009, *Standard on Accessible and Usable Buildings and Facilities*.

Statement of Problem and Substantiation for Public Comment

This comment is the result of work done by Michael Weaver, Thomas Domitrovich, Brian Rock, David Humphrey and John McCamish.

In the 1990's receptacle requirements for peninsulas and islands were discussed extensively and added to the NEC. Input was made to delete these receptacles due to the risk of injury to children and others when a electrical cord supplying an appliance is pulled on, or caught as a person is walking by, resulting in injury. The receptacles stayed on the islands and peninsulas however, due to the concern that lack of receptacles would cause people to use or misuse extension cords to power their countertop appliances.

It is important to note that this concern over the misuse of extension cords was not substantiated by injuries, although prior to the 1990's, these receptacles on islands and peninsulas were not required and therefore not likely to be installed.

What has been substantiated is that in spite of the cords to appliances getting shorter and the receptacles on islands and peninsulas being limited in quantity (though still required) injuries still happen due to cords being pulled or caught by people.

This comment seeks to eliminate the requirement for these receptacles, and if they are installed, countertop receptacles would be required. This is proposed to reduce substantiated injuries whether receptacles are chosen to be installed or not. Language has also been added to help the installer where a surface behind a sink is not available for a receptacle to be installed

Related Item

- FR 9121

Submitter Information Verification

Submitter Full Name: John McCamish
Organization: NECA IBEW Electrical Training
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 09 13:52:41 EDT 2021
Committee: NEC-P02

Public Comment No. 1954-NFPA 70-2021 [Section No. 210.52(C)(3)]

(3) Island and Peninsular Countertops and Work Surfaces.

Receptacle outlets shall be installed in accordance with 210.52(C)(3)(a) and (C)(3)(b).

(a) *Locations with Countertop or Work Surface Wall Spaces.* At least one receptacle outlet shall be installed where the location is also provided with countertops or work surfaces totaling more than 1.2 linear m (4 linear ft).

(b) *Locations without Countertop or Work Surface Wall Spaces*. Receptacle outlets shall be installed in accordance with one of the following. Receptacle outlets shall be permitted to be located as determined by the installer, designer, or building owner.

(1) At least one receptacle outlet shall be provided for the first 0.84 m^2 (9 ft^2), or fraction thereof, of the countertop or work surface. A receptacle outlet shall be provided for every additional 1.7 m^2 (18 ft^2), or fraction thereof, of the countertop or work surface. Sinks, cooktops, or similar shall not be included in the measurement.

~~At~~

(2) Peninsular countertops and peninsular work surfaces shall have at least one receptacle outlet

~~shall be~~

(3) located within 600 mm (2 ft) of the outer end

~~of a peninsular countertop or work surface~~

(4) .

Where a peninsular countertop is connected to a wall countertop, the peninsular countertop shall be measured from the connected wall countertop. Where a peninsular countertop is connected to a wall, the peninsular countertop shall be measured from the wall.

Statement of Problem and Substantiation for Public Comment

In Public Input 4614, the intent was to explain that the current language does not clearly define the difference between an island and a peninsula. As written, it is unclear if the word "peninsular" applies to only countertops, or also to work surfaces. A work surface that is not peninsular could be an island. Without making it clear that "peninsular" applies to both countertops and work surfaces in (2), it could be interpreted that you need a receptacle within 2' of the outer end of any work surface on an island, which of course has several "outer ends." For example, if it is an 8' square island it would have four outer ends. If the contractor installs the proper number of outlets for the island as required for the square footage, he would also have to comply with the outer end requirement. Is this the intent here, or are we really only concerned with the outer end of a peninsula? The resolution to my PI states that removing the work surfaces wording would eliminate a power source from locations that have frequent power needs, it then further states that the language applies to peninsular countertops and peninsular work surfaces, which is not exactly what the code language as written says. This change would clearly indicate the the outer end requirement only applies to a peninsula.

Related Item

- resolution of PI 4614

Submitter Information Verification

Submitter Full Name: Randal Hunter
Organization: HTS
Street Address:
City:
State:
Zip:

Submittal Date: Wed Aug 18 19:16:46 EDT 2021
Committee: NEC-P02

Public Comment No. 222-NFPA 70-2021 [Section No. 210.52(C)(3)]

(3) Island and Peninsular Countertops and Work Surfaces.

Receptacle outlets shall be installed in accordance with 210.52(C)(3)(a) and (C)(3)(b).

(a) *Locations with Countertop or Work Surface Wall Spaces.* At least one receptacle outlet shall be installed where the location is also provided with countertops or work surfaces totaling more than 1.2 linear m (4 linear ft).

(b) *Locations without Countertop or Work Surface Wall Spaces*. Receptacle outlets shall be installed in accordance with one of the following. Receptacle outlets shall be permitted to be located as determined by the installer, designer, or building owner.

(1) At least one receptacle outlet shall be provided ~~for the first 0.84 m ^{2} (9 ft ^{2}), or fraction thereof, of the countertop or work surface. A receptacle outlet shall be provided for every additional 1.7 m ^{2} (18 ft ^{2}), or fraction thereof, of the countertop or work surface. Sinks, cooktops, or similar shall not be included in the measurement.~~ .

(2) At least one receptacle outlet shall be located within 600 mm (2 ft) of the outer end of a peninsular countertop or work surface.

Where a peninsular countertop is connected to a wall countertop, the peninsular countertop shall be measured from the connected wall countertop. Where a peninsular countertop is connected to a wall, the peninsular countertop shall be measured from the wall.

Statement of Problem and Substantiation for Public Comment

I propose this change because this should be optional for people that live in the house. I receive lots of complaints that there are to many receptacles for an island. I also believe the NEC should stick to regulating safety not human preference and design.

Related Item

• island

Submitter Information Verification

Submitter Full Name: Ilie Hanceri
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jul 13 23:49:34 EDT 2021
Committee: NEC-P02

Public Comment No. 737-NFPA 70-2021 [Section No. 210.52(C)(4)]

(4) Receptacle Outlet Location.

Receptacle outlets shall be located in one or more of the following:

(1) On or above countertop or work surfaces: On or above, but not more than 500 mm (20 in.) above, countertops or work surfaces.

(2) In countertop or work surfaces: Receptacle outlet assemblies listed for use in countertops or work surfaces shall be permitted to be installed in countertops or work surfaces.

(3) ~~Below countertop or works surfaces: Not more than 300 mm (12 in.) below countertops or work surfaces. Receptacles installed below a countertop or work surface shall not be located where the countertop or work surface extends more than 150 mm (6 in.) beyond the face of such receptacles.~~

Receptacle outlets rendered not readily accessible by appliances fastened in place, appliance garages, sinks, or rangetops as covered in 210.52(C)(2), Exception, or appliances occupying assigned spaces shall not be considered as these required outlets.

Informational Note No. 1: See 406.5(E) and 406.5(G) for installation of receptacles in countertops and 406.5(F) and 406.5(G) for installation of receptacles in work surfaces. See 380.10 for installation of multioutlet assemblies.

Informational Note No. 2: See Annex J and ANSI/ICC A117.1-2009, *Standard on Accessible and Usable Buildings and Facilities*.

Additional Proposed Changes

File Name	Description	Approved
PC_737_Attachment_2_C_Einstein_Miller.pdf	Burn Injuries_Spring2020	
PC_737_Attachment_C_Einstein_Miller.pdf	Burn Injuries_Spring 2021_1991-2020	

Statement of Problem and Substantiation for Public Comment

CPSC staff recommends deleting 210.52(C)(4)(3), as proposed by Public Inputs (PIs) No. 2085 and No. 1732 – NFPA 70-2020, to remove the allowance for receptacle outlets located below countertops or work surfaces. The use of receptacles below the countertop to supply cord-and-plug-connected cooking appliances, such as deep fryers and sous vide cookers, exposes the appliance cord to being pulled, which can cause the appliance to tip and spill hot contents, resulting in severe burns and death.

Data sets compiled by CPSC epidemiologists show that there were 45 anecdotal reports of burn/other injuries between Jan 1991 through 2020, as well as an estimated 9,700 burn/other injuries treated in U.S. hospital emergency departments. The data sets indicate that the injuries were caused by tipping and spilling the contents of countertop cooking appliances, many of which specifically involved children pulling on the appliance cord. Many of these incidents involved second- and third-degree burn injuries; and 10 resulted in death, including the deaths of infants as young as 8 months of age. The investigations revealed that children may pull power cords, or the cords may get snagged inadvertently when a person is walking by. The data sets presented here are reported incidents in CPSC databases, and the number of actual burns on a national scale is likely much greater.

A requirement for receptacles on kitchen islands and peninsulas was first incorporated in the 1990 NEC. At the time, the rationale for adding a minimum receptacle requirement to islands and peninsulas was to discourage use of extension cords to supply power to cooking appliances on these surfaces. Although the attached data sets were compiled to look at potential impact by previous changes in the NEC, the incident data do not specifically address the type of countertop that was involved, nor whether the specific cord was the supply cord-and-plug of the appliance, or a supplementary extension cord. Sections 210.52(C)(4)(1) and 210.52(C)(4)(2) provide the installer with safe and practical options above all countertops, including kitchen islands and peninsulas, to install receptacles for countertop cooking appliances.

* This proposal is that of the CPSC staff, has not been reviewed or approved by, and may not necessarily reflect the views of, the Commission.

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Related Item

• PI 1732 – NFPA 70-2020 • PI 2085 - NFPA 70-2020

Submitter Information Verification

Submitter Full Name: Einstein Miller
Organization: US Consumer Product Safety Commission
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 03 15:07:30 EDT 2021

Committee: NEC-P02

Burn injuries due to Appliances Pulled from Counters - All Ages

1/1/1999 - 12/31/2019*

*Based on reports entered into CPSRMS no later than 12/31/19.

Deaths are shown in **bold** font.

Disclaimer: CPSC does not guarantee the accuracy, completeness, or adequacy of these data particularly with respect to information submitted by people outside of CPSC. This spreadsheet was prepared by CPSC staff, has not been reviewed or approved by, and may not necessarily reflect the views of the Commission.

#	Document Numbers	Date	Age/Sex	State	Narrative
1	990203HEP9003	1/1999	F	IL	THE 12 MONTH OLD FEMALE VICTIM SUSTAINED 2ND DEGREE BURNS TO THE UPPER BODY AFTER TRIPPING ON A CHAIR AND WHILE TRYING TO BALANCE HERSELF PULLED THE DEEP FRYER WITH HOT GREASE IN IT OFF THE COUNTER CAUSING GREASE TO BE DUMPED INTO HER SCALP, FACE AND UPPER BODY. THE VICTIM WAS TAKEN BY AMUBLANCE TO THE HOSPITAL AND ADMITTED.
2	011126HCC1141	9/1999	2 YOM	PA	A 34 MONTH OLD MALE SUFFERED 2ND & 3RD DEGREE BURNS OVER HIS BODY WHEN HE MANAGED TO PULL THE CORD OF AN ELECTRIC COOKER OFF OF A RANGE TOP. THE VICTIM'S MOTHER WAS ALSO INJURED DURING THE INCIDENT.
3	G0110241A	12/2000	16 MOF	IA	A GIRL, AGED 16 MONTHS, SUSTAINED 2ND AND 3RD DEGREE BURNS AND WAS HOSPITALIZED WHEN SHE PULLED A SLOW COOKER FROM THE TOP OF A COUNTER SPILLING IT CONTENTS ONTO HERSELF.
4	N0120165B	1/2001	10 MOF	FL	A 10 MONTH OLD FEMALE WAS HOSPITALIZED IN INTENSIVE CARE AFTER SHE PULLED A SLOW COOKER FULL OF BLACK-EYED PEAS ON TOP OF HERSELF.
5	N0170342A	7/2001	18 MOF	NC	AN 18 MONTH OLD GIRL WAS HOSPITALIZED WHEN SHE SPILLED HOT OIL FROM A DEEP FRYER OVER HER FACE AND UPPER BODY. THE FRYER HAD BEEN OFF BEFORE THE GIRL GRABBED IT. SHE SUFFERED 1ST & 2ND DEGREE BURNS TO HER FACE, CHEST, NECK, SHOULDERS AND ARMS.

6	G01A0032A 011012HCN0048	10/2001	10 MOM	IL	A 10 MONTH OLD MALE PULLED THE POWER CORD TO AN ELECTRIC [REDACTED] LOCATED ON A KITCHEN COUNTER WHILE WALKING IN HIS BABY WALKER. THE [REDACTED] FELL OFF THE COUNTER AND SPLASHED BOILING WATER ONTO THE VICTIM. THE VICTIM SUSTAINED SECOND AND THIRD DEGREE BURNS OVER FORTY PERCENT OF HIS BODY.
7	X0252647A	4/2002	7 MOM	IN	A MALE INFANT, AGE 7 MONTH, IN HIS WALKER, PULLED ON THE CORD ATTACHED TO THE DEEP FAT FRYER CAUSING HOT GREASE TO FALL ON HIM. HE RECEIVED 2ND & 3RD DEGREE BURNS OVER 45% OF HIS BODY & WAS HOSPITALIZED.
8	N0280329A	8/2002	18 MOM	TN	A BOY, AGE 18 MONTH, GRABBED HOLD OF THE DEEP FRYER CORD & JERKED IT WHEN THE WHOLE UNIT WITH HOT COOKING OIL FELL ON TOP OF HIM. HE RECEIVED BURNS & WAS HOSPITALIZED IN CRITICAL CONDITION.
9	G0330230A	3/2003	13 MOF	OK	A GIRL, AGE 13 MONTH, WAS HOSPITALIZED FOR BURNS WHEN SHE PULLED AT THE PLUG ON A DEEP-FAT FRYER, CAUSING BOILING GREASE TO FALL OVER HER.
10	I0380363A	7/2003	6 MOF	TX	A FEMALE INFANT, AGE 6-8 MONTHS, WAS BURNED WHEN SHE PULLED ON THE CORD OF AN ELECTRIC POT WITH HOT BEANS AND WATER. SHE WAS IN AN INFANT WALKER AT THE TIME.
11	B0420137A 040212HCC2327	2/2004	18 MOM	TX	AN 18-MONTH OLD MALE RECEIVED SCALD-BURNS TO 11% OF HIS BODY INCLUDING HIS FACE, NECK AND UPPER BODY WHEN HE PULLED ON AN [REDACTED]'S ELECTRIC CORD WHILE STANDING ON A TODDLER STEP TRYING TO GET A DRINK FROM A DRINKING BOTTLE. THE VICTIM'S MOTHER WAS IN THE LIVING ROOM WHEN THE INCIDENT OCCURRED. SHE WAS PREPARING A BEEF-ROAST IN THE [REDACTED] FULL OF HOT WATER WHEN THE INCIDENT OCCURRED.
12	X0421171A	2/2004	4 YOF	TX	A GIRL, AGE 4, WAS HOSPITALIZED FOR 12% TBSA BURNS RECEIVED AFTER SHE PULLED A DEEP FRYER OFF A TABLE AND WAS BURNED BY HOT OIL.
13	X0441895A	4/2004	2 YOF	TX	A GIRL, AGE 2, WAS HOSPITALIZED FOR BURNS WHEN HOT BEANS SPILLED ON HER WHILE PULLING A SLOW COOKER CORD.

14	**X0462681A 041124HCC3056**	**5/2004**	**10 MOM**	**CA**	**A TEN MONTH OLD MALE VICTIM DIED AS A RESULT OF BURNS SUSTAINED FROM AN ACCIDENT IN HIS SITTER'S HOME. VICTIM WAS IN A BABY WALKER IN THE KITCHEN WHEN HE PULLED ON AN ELECTRICAL CORD ATTACHED TO A SLOW COOKER WHICH WAS ON TOP OF THE KITCHEN'S CENTER ISLAND. THE SLOW COOKER WAS FULL OF HOT WATER AND BEANS WHICH WERE COOKING. VICTIM PULLED ON THE CORD AND CAUSED THE SLOW COOKER TO FALL ON TOP OF HIM, HITTING HIS HEAD AND CAUSING THE HOT WATER TO SPLASH ALL OVER HIS BODY. VICTIM SUSTAINED DEEP SCALDING BURNS 38% OF HIS BODY. VICTIM WAS TREATED BY PARAMEDICS AND TRANSPORTED TO LOCAL HOSPITAL. VICTIM DIED A DAY LATER WHEN HE WENT INTO CARDIAC ARREST FROM MULTIPLE COMPLICATIONS OF THERMOCUTANEOUS**
15	X0484002A	7/2004	9 MOF	TX	A FEMALE INFANT, AGE 9 MONTHS, WAS IN HER BABY WALKER WHEN SHE PULLED THE CORD TO AN ELECTRIC FRYER, SPLLING HOT OIL ON HERSELF. SHE WAS HOSPITALIZED FOR BURNS OVER 50% OF HER BODY SURFACE.
16	X0510506A	1/2005	9 MOM	TX	A 9 MONTH OLD MALE INFANT WAS HOSPITALIZED FOR SCALD BURN INJURY RECEIVED AFTER HE PULLED THE CORD OF A DEEP FRYER, SPILLING THE CONTENTS ONTO HIM.
17	X0580626A	8/2005	8 MOM	TX	A MALE INFANT, AGE 8 MONTHS, WAS HOSPITALIZED FOR BURNS FROM HOT GREASE. HE WAS IN THE KITCHEN IN HIS WALKER WHEN HE GRABBED AN ELECTRIC SKILLET CORD & PULLED PAN ONTO HIMSELF.
18	**X0840259A**	**3/2007**	**9 MOF**	**TX**	**A 9 MONTH OLD FEMALE PULLED THE CORD OF A SLOW COOKER CONTAINING HOT SOUP PULLING THE SLOW COOKER OFF OF THE KITCHEN COUNTER CAUSING THE**
19	U0852270A	4/2008	11 MOM	NE	A BOY, AGE 11 MONTHS, WAS HOSPITALIZED AFTER HIS UPPER BODY WAS BURNED BY SCALDING WATER. HE PULLED A VEGETABLE STEAMER FULL OF WATER FROM A KITCHEN COUNTER.
20	**0906033627**	**2/2009**	**8 MOM**	**CA**	**DECEDENT WAS IN A WALKER AND PULLED AN ELECTRIC RICE COOKER OFF A TABLE ONTO HIMSELF WITH ITS CORD. CAUSE OF DEATH: METHICILLIN RESISTANT STAPHYLOCOCCUS AUREUS SEPSIS WITH WATERHOUSE FRIEDRICKSON SYNDROME; COMPLICATIONS OF THERMAL INJURIES. AUTOPSY: YES.**
21	X1180837A	8/2009	M	IA	Male toddler was having his diaper changed near a slow cooker that was on and he was able to pull the slow cooker on top of himself. He suffered severe burns over 25% of his body.
22	**X1250752A X10B0267A**	**5/2010**	**2 YOM**	**SC**	**2 YOM decedent accidentally pulled slow cooker over onto himself. He sustained severe burns & was transported to medical facility COD: Sepsis due to Burns.**

23	**1148034468**	**2/2011**	**16 MOF**	**TX**	**THE 16-MONTHS-OLD FEMALE DECEDENT GRABBED AND PULLED AN ELECTRIC CORD ATTACHED TO A BOILING [REDACTED] OFF OF THE COUNTERTOP IN THE KITCHEN AT HER RESIDENCE AND THE BOILING CONTENTS SPILLED ONTO HER. HOSPITAL ER/OUTPATIENT DEATH. CAUSE OF DEATH: COMPLICATIONS OF 30 PERCENT TBSA THERMAL BURNS. AUTOPSY: YES.**
24	X13C0187A	11/2013	8 MOF	AZ	8 MOF was in the kitchen with her grandmother when she pulled the cord of an electric skillet filled with cooking oil. The burning oil and food fell fromthe counter onto the child. She was hospitalized with severe burns to her face and body.
25	X0383932A 030827HCC2633 I0380358A	7/2003	29 YOM	LA	A 9-MONTH-OLD MALE RECEIVED SECOND AND THIRD DEGREE BURNS TO HIS FACE, ARMS, CHEST, AND UPPER THIGHS WHEN HE PULLED THE POWER CORD CONNECTED TO A [REDACTED]. THE [REDACTED] HAD BEEN PREHEATING OIL FOR APPROXIMATELY THREE MINUTES WHEN THE OIL SPILLED ONTO THE VICTIM. THE VICTIM IS STILL RECOVERING FROM THE BURNS HE RECEIVED.
26	X04C0220A	12/2004	13 MOM	LA	A 13 MONTH OLD MALE WAS HOSPITALIZED FOR 7% TBSA SCALD BURN INJURY RECEIVED AFTER HE PULLED THE CORD OF A DEEP FRYER ONTO HIMSELF.
27	**X0660388A**	**1/2006**	**70 YOF**	**FL**	**A WOMAN, AGE 70, DIED OF THERMAL BURNS WHEN SHE ACCIDENTALLY PULLED A DEEP FRYER FILLED WITH HOT OIL ONTO HER BODY.**
28	I0940195A	3/2009		PA	DEEP FRYER CORD GETS VERY HOT WHILE IN USE & BECOMES TOO HOT TO UNPLUG FROM THE OUTLET. THE PLUG BEGINS TO GET SOFT, ALMOST MELT, SO WHEN IT IS PULLED OUT, THE PRONGS PULL OUT OF THE PLUG. IT GETS WORSE WITH EVERY USE. IT GETS HOT ENOUGH TO BURN THE CONSUMER.
29	X11C0404A 121109HCC2098	11/2011	86 YOM	IL	An 86 YOM sustained third-degree burns when a turkey deep fryer filled with hot oil poured on his leg. He was frying turkey during an event when the accident occurred. He stepped on a cord & pulled the whole tank down on top of him. He had a skin graft surgery after burning his leg.

Burn injuries due to Appliances Pulled from Counters

1/1/1999 - 12/31/2019*

*Based on reports entered into NEISS no later than 12/31/19.
Deaths are shown in **bold** font.

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#	nek	dt_trmt	Age/Sex	Narrative
1	70226857	2/2007	20 MOM	PT PULLED [REDACTED] CORD & PULLED [REDACTED] OF BBQ SAUCE & MEATBALLS OVER ON HIM DX SCALD LEG / FOOT
2	70745549	2/2007	4 YOM	PATIENT PULLED [REDACTED] OF SCALDING SOUP FROM COUNTER ONTO HIMSELF ATHOME, WEARING T-SHIRT/SWEATSHIRT W/JEANS; 1ST/2ND DG FACE/NECK/CHEST BU
3	70301992	2/2007	9 MOM	PULLED [REDACTED] OF HOT POTPOURRI WATER ON HEAD, [REDACTED] HIT SIDE OF HEAD& SUBSTANCE SPLASHED PTS BODY, 1ST DEG BURN FACE/CHEST/ARM <10%BSA, CHI
4	70646147	6/2007	37 YOF	PULLED 110V CORD FROM RECEPTACLE FLAMES SHOT AND JOLT TO (R) ARM PT HASBURN TO (R) THUMB NO FIRE DEPT. INVOLVMENT
5	80349622	10/2007	9 MOM	GRABBED [REDACTED] BY SINK WHEN MOM BATHING HIM IN SINK;DX BURNED HAND
6	71132932	11/2007	16 MOF	ELECTRICAL BURN HAND WHEN GRABBED TAPED ELECTRICAL CORD.EMS CHECKED HER
7	71149578	11/2007	9 MOF	DAD COOKING FRIES IN [REDACTED] AT HOME, PT CAME BY IN WALKER & PULLED CORD OF [REDACTED] W/HOT GREASE ONTO FACE,CHEST & EXT; 2ND DEGREE BURNS
8	80221363	2/2008	12 MOM	DX SUPERFICIAL PARTIAL THICKNESS BURNS: PT PULLED ON CORD OF [REDACTED] AND IT FELL TO FLOOR SPLASHING PT WITH BOILING WATER
9	80410596	3/2008	17 MOM	PULLED ELECTRIC COFFEE POT ON TO SELF. COFFEE BURNED ARMS. DX 2ND DEGREE BURNS
10	80628846	6/2008	3 YOM	ELECTRIC CORD HAD A BARE SPOT WHERE DOG HAD CHEWED PT GRABBED CORD HASBURN TO PALM OF HAND
11	80943982	9/2008	49 YOF	PT PULLED "RICE COOKER" POT WITH HOT WATER IN IT , SUSTAINED BURN TO ARM

12	81210578	11/2008	4 YOF	PT WAS STANDING NEXT TO BROTHER WHO PULLED A [REDACTED] OF SOUP OFF OF COUNTER. DX: 1-2% PARTIAL THICKNESS BURN BUTTOCKS.
13	81147857	11/2008	10 YOM	PATIENT AT SCHOOL MAKING APPLE BUTTER IN [REDACTED], PULLED [REDACTED] OFFONTO LAP; 2ND DEGREE THIGH BURNS 3% TBSA
14	90107900	1/2009	19 YOM	DX FULL THICKNESS BURNS TO LOWER LEG/ PARITAL THICKNESS (DEEP) BURNS TO R HAND: AWOKE TO ELEC OUTLET ON FIRE GRAB'D & PULLED CORDS F OUTLET
15	90312161	1/2009	20 MOM	PT PULLED CORD OF ELECTRIC TEA POT ON COUNTER AND IT SPILLED. DX: SCALD BURNS BILAT LEGS 4%.
16	90209029	1/2009	17 MOM	DX 2ND DEG BURN HEAD-MULT: FOP STATES " PULLED RICE COOKER OFF ISLAND ONTO NECK & FACE" PT PULLED CORD, RICE COOKER & CONTENTS FELL ON FACE
17	90249557	2/2009	14 MOF	PT PULLED AN ELEC CORD OUT OF THE OUTLET 3 WKS AGO. HAD BURN ON L INDEXFINGER. SAW PCP. WOUND IS NOW RED, WARM, SWOLLEN. DX CELLULITIS FINGER
18	90331473	3/2009	13 YOM	PULLING PLUG FROM AN OUTLET AND WAS SHOCKED. DX 1ST DEGREE BURN - FINGER
19	90321077	3/2009	14 YOM	PT PULLED [REDACTED] FULL OF HOT WATER ON UPPER EXTREMITIY 2ND DEGREE BURN NECK FACE, NECK, CHEST AND ABDOMEN
20	90557542	4/2009	18 MOM	GRABBED ELECTRIC CORD;DX BURNED HAND
21	90436385	4/2009	8 MOM	PT IN WALKER AND PULLED CORD ON ELECTRIC COFFEE POT SPILLING HOT LIQUIDON HEAD, RECEIVED BURNS TO HEAD, SHOULDERS, BACK AND HANDS*
22	90660702	6/2009	22 MOF	PT PULLED COFFEEPOT CORD, HOT WATER FOR COFFEE SPILLED ON PTS FACE AND SHOULDER, BURN TO FACE
23	90725670	7/2009	14 MOM	PATIENT PULLED CORD ON [REDACTED] OFF COUNTER ONTO HIMSELF, SPILLED HOT LIQUID ON SHIRT ON BACK; 2ND DG BACK BURN, 1ST DG SPLATTER, HEAD INJURY
24	91013265	10/2009	15 MOM	PT PULLED CORD TO DEEP FRYER SHORTLY AFTER IT HAD BEEN TURNED OFF SPLASHED HOT GREASE ONTO FEET AND LOWER LEGS DX- 2ND DEGREE BURNS
25	100235091	2/2010	2 YOM	2 YO OLD M PULLED CORD TO DEEP FRYER CAUSING GREASE TO SPLASH ON LEG BURN LEG
26	100402601	3/2010	2 YOM	2YOM PULLED [REDACTED] OFF COUNTER AT HOME, BOILING LIQUID FROM FOOD IN COOKER LANDED ON PTS L THIGH, PENIS, ABD. TX TO BURN CENT. DX BURN THIG
27	100415933	4/2010	12 MOF	12 MOF SUSTAINED A LIQUID BURN OF UPPER ARM BY PULLING ON A [REDACTED] CORD.
28	100505514	4/2010	21 MOM	CHEST, LEGS, & ARMS BURNED-21MOM-PULLED FRYER W/ HOT GREASE OFF COUNTERONTO SELF-@ HOME
29	100541387	5/2010	3 YOM	3YOM GRABBED EITHER THE EDGE OR CORD OF A [REDACTED] WHICH WAS FILLED W/NACHO CHEESE THAT FELL ONTO PT'S FACE/ARM.DX:BURNS:EAR/NECK/BACK/ARM
30	100559045	5/2010	16 MOM	16 MO M SITTING ON COUNTER AT HOME, MOM TURNED AROUND CHILD PULLED OVERCOFFEE MAKER BREWING LEG BURNED WITH COFFEE GROUNDS. DX UPPER LEG BURN

31	100654200	6/2010	17 YOM	17 YOM GRABBED BURNING ELECTRICAL CORD WITH FINGERS. DX-2ND DEGREE BURN TO FINGERS
32	101111173	10/2010	13 MOM	13MON OLD MALE-MOM WAS FIXING PANCAKES AND THE PT PULLED THE CORD ON TOTOP OF HIM & BATTER LANDED ON FACE. DX :PARTIAL THICKNESS BURN TO FACE
33	101134427	11/201	21 MOM	21 MOM PULLED STEAMER MACHINE DOWN OFF COUNTER ONTO SELF;SCORCHING BILAT LEGS. DX##: BURNS BILAT LEGS
34	110139278	1/2011	46 YOF	SUPER. BURNS L WRIST <1% BS: 46YOF MAKING CHICKEN, CORD HANGING DOWN - PULLING ELECTRIC FRY PAN OVER, SPILLING HOT GREASE, 1% BURN L WRIST
35	110147254	1/2011	10 MOM	1ST & 2ND DEGREE BURN HAND-10MOM GRABBED AN ELECTRIC SKILLET AT HOME
36	110223834	2/2011	10 MOF	12-15% BS AREA BURNS W/ HOT GREASE: 10MOF PULLED ON ELECTRIC CORD PULLED FRENCH FRY FRIER ON HER,HOT GREASE1,2,3 DEGREE BURN BUTTOCK,LEG
37	110319118	2/2011	37 YOM	ELECTRICAL BURN RT.FOREARM.37YOM.PT.REFERS WHILE PULLING OUT ELECTRIC CORD,(HOMELESS PATIENT)
38	110433097	4/2011	71 YOF	71 YOF PULLEDF CORD ON [REDACTED] AND FOOD SPILLED ON HER DX: 2ND DEGREE BURNS BILAT THIGHS
39	110632965	6/2011	6 YOF	6YOF-HAND BURN-GRABBED A HOT DEEP FRYER-@ HOME
40	110702851	6/2011	12 MOM	12MOM MOM FEEDING PT RICE @ HOME, PT PULLED RICE COOKER WIRE FROM KITCHEN ISLAND, HOT WATER SPILLED ON PT; 1/2 DG BURN FACE/NECK/CHEST/ARM/LEG
41	120158395	1/2012	3 YOM	3YOWM PT PULLED THE CORD OF A [REDACTED] & PULLED IT OFF THE COUNT ER RESULTING IN SPLASH BURNS OVER ONTO FRONT. DX. BURN FACE, L KNEE, L
42	120316976	2/2012	13 MOM	213MMC, BABYSITTER WAS COOKING HOT GREASE IN ELECTRIC FRYING PAN W/CORD HANGING DOWN, CHILD PULLED CORD GREASE FELL ONTO CHILD/BURNS 25-50%
43	120341226	3/2012	19 MOM	19MOM PULLED A FRYING PAN OF HOT GREASE DOWN , CAUSING BURNS TO FACE AND LEFT HAND, TRANSFERRED TO A BURN CENTER
44	120417466	3/2012	21 MOM	21 MONTH OLD MALE PULLED [REDACTED] COFFEE MAKER DOWN ONTO SELF BURNING CHEST ON HOT WATER TO CHEST AND ABDOMEN AND TRNSF TO SHRINERS
45	120506040	4/2012	19 MOM	19MOM PULLED CORD ON FRENCH PRESS, IT TIPPED OVER, SPLASHED HOT WATER ONTO PT DX 1ST DEGREE BURNS INNER THIGH
46	120537191	5/2012	11 MOM	11MOM PULLED CORD OF AN ELECTRIC SKILLET FULL OF MEAT AND HOT OIL,SPLASHED ONTO PT,SKILLET DIDNT LAND ON PT;2ND DEGREE SCALD BURN TO NECK
47	120558202	5/2012	20 MOF	MOTHER STATES CHILD PULLED ON ELECTRIC SKILLET AND HOT WATER SPILLED ONHER. 2ND DEG BURN TO BACK. 20 MOF*
48	130131078	7/2012	5 YOF	5YOF W/2ND DEG BURNS OF CHEST (8-9%) 2/2 PULLING [REDACTED] OF HOT PEAS OFF COUNTER. DIDN'T KNOW IT WAS STILL PLUGGED IN & HANDLES WERE NOT HOT
49	121028150	9/2012	3 YOF	3 YOF CLIMBED ONTO CHAIR AND PULLED RICE COOKER OVER AT HOTEL ROOM. DX: BURNS L ARM AND FACE.
50	121127557	10/2012	23 YOF	23 YR OLD FEMALE WITH ELECTRICAL BURN TO HAND PULLING ELECTRIC CORD OUTOF WALL SOCKET

51	130155873	1/2013	14 MOM	=14 MOM PULLED A CANDLE OFF TABLE WHEN HE PULLED ON A CORD, SUSTAINEDBURN TO PERIORBITAL AREA. DX SECOND DEGREE BURN, FACE
52	130202288	1/2013	14 MOF	14MOF MOM WAS COOKING PORK IN A [REDACTED] PT RUNNING TRIPPED ON CORD OFTHE POT AND IT DUMPED OVER GREASE ONTO FEET SCALD BURNS TO FEET
53	130215249	1/2013	16 MOM	16MOM PULLED ON CORD OF COFFEE MAKER, COFFEE SPILLED ON PT; FACIAL BURNS, ARM BURN
54	130212927	2/2013	2 YOM	2 YO M PULLED COFFEE POT OFF COUNTER, LANDED ON LOWER ARMS DX THERMAL BURN FOREARMS
55	130228559	2/2013	6 MOM	6 MOS M PT PULLED DOWN A SMALL [REDACTED] FULL OF HOT WAX ONTO TO HIMSELF, BURNING NECK,HANDS,FOREARM. DX 3RD DEGREE BURN NECK TRANSFER
56	130536469	2/2013	18 MOM	18MOM W/BURNS TO UPPER ARM & FLANK/BACK (9-12% TBSA) 2/2 PULLING OVER A[REDACTED] FULL OF HOT WATER ON HIMSELF AT HIS GM'S HOUSE.
57	130602796	5/2013	3 YOM	3YOM WITH BURNS TO FOOT AFTER PULLING [REDACTED] OFF COUNTER AND THE FOOD SPILLED ONTO FEET.
58	130646957	6/2013	4 YOM	4YR M PULLED COFFEE POT DOWN;DX BURN TO ANKLE
59	130723577	6/2013	9 MOM	9MOM PULLED A [REDACTED] OF HOT FOOD DOWN ON HIS BODY, 60%BURNS TO BODY, TRANSFERRED
60	130840071	8/2013	3 YOF	3 YOF PULLED ELECTRICAL CORD, HEARD A ZAP AND HAND WAS COVERED WITH BLACK SOOT - ELECTRICAL BURN HAND
61	131044844	10/2013	2 YOM	PT PULLED COFFEE POT OFF COUNTER. BURN FOREARM, LEFT. 2 YOM*
62	140120034	1/2014	2 YOF	2YOF PULLED [REDACTED] DOWN LAST NIGHT, HOT WATER SPLASHED ON ARM, FOOT;BURN INJURY FOREARM, FOOT
63	140306687	2/2014	15 MOM	15 MO M PULLED CORD TO POT WHICH WAS BOILING WATER & IT SPILLED ON HIM.DX: PT BURNS 15-20% TBSA FACE AND TORSO.
64	140347005	2/2014	11 MOM	11MOM W/BURNS TO FACE,NECK,CHEST,UPPER EXT & LOWER LEG 2/2 PULLING THE CORD ON AN ELECTRIC FRYER & THE HOT GREASE FELL ONTO HIM AT HOME.
65	140440567	4/2014	3 YOM	3 YOM PULLED A COFFEE POT OVER POURING HOT COFFEE AND GRINDS ONTO HIMSELF DX BURNS 2ND DEGREE
66	140549201	5/2014	10 MOF	10MOF PULLED [REDACTED] CORD AND FOOD SPLATTERED ON HER AT HOME. DX BURNS TO FACE, ARMS, HAND, LEGS
67	140555455	5/2014	13 MOM	13MOM- PT PULLED OVER A HOT KETTEL OF HOT WATER OFF THE COUNTER PULLED ONTO CORD/ FACE-NECK & TRUNKDX- BURNS TO FACE,NECK & CHEST AREA.
68	140740999	7/2014	7 YOM	7 YO WM BURNED (R) UPPER ARM AND (L) ARM FROM ELBOW TO HAND WHEN PULLEDA [REDACTED] OVER ON HIM WITH GRAVY AND ROAST IN IT ACCIDNETALLY AT HOME
69	140844761	7/2014	12 MOM	12 MO M PULLED HOT [REDACTED] ON HIMSELF. DX THERMAL 1ST AND 2ND DEGREE BURNS TO HAND B
70	140831022	7/2014	2 YOM	2YOM PULLED ELECTRIC CORD TO DEEP FRYER ON COUNTER,DUMPING BURNING/BOILING LIQUID ON SELF DX: BURNS 50-50% OF BODY SURFACE,<10% 3RD DE BURNS

71	140846652	8/2014	61 YOF	61YOF AT HOME 2ND DEGREE BURNS TO R MEDIAL FOREARM & ABDOMEN S/P PULLING [REDACTED] ROAST ON SELF,DX 2ND DEGREE BURN ABD WALL 1ST DEGREE R FOREA
72	140959789	8/2014	4 YOM	4YOM W/BURNS TO LOWER ABD,BUTTOCKS & HAND 2/2 PULLED HOT WATER ONTO HIMSELF FROM STEAM CLEANER. 5% TBSA.
73	140903010	8/2014	15 MOM	15MO OLD M PULLED DOWN [REDACTED] SPILLING IN FACEFACIAL BURN
74	141020568	10/2014	2 YOF	2 YOF PULLED A DEEP FAT FRYER DOWN & THE HOT OIL SPILLED ONTO HER ABD., THIGHS & LT. LOWER LEG - GREASE BURNS.DX; PARTIAL THICKNESS BURNS
75	141223676	12/2014	21 MOM	21 MONTH OLD MALE WAS PLAYING WITH CORD PLUGGED INTO WALL AFTER PULLING ON CORD SMALL FLAME STARTED & BURNT CHILDS HAND NO FIRE DX BURN HAND
76	150126144	12/2014	14 MOF	14MOF GRABBED A [REDACTED] AND BURNED FOREARM AND ELBOW, 2ND DEGREEBURN TO FOREARM, TRANSFERRED, NO FD
77	150204271	1/2015	6 YOM	6YOM-LOWER BACK BURN-ACCIDENTLY PULLED A [REDACTED] FULL OF HOT CANDLE WAX OFF A SHELF SPLATTERING WAS ON LOWER BACK-@ HOME
78	150346980	3/2015	16 MOM	16 MO M PULLED THE CORD OF AN ELECTRIC TEA KETTLE AND SPILLED HOT BOILING WATER ONTO L FOOT. DX: L FOOT SECOND DEGREE SCALD BURN
79	150450299	4/2015	12 MOM	12MOM-PT WAS IN HIGH CHAIR PULLED ONTO RICE COOKER THAT HAD BOILING WATER FELL ONTO THIGH ABDOMDX- PARTIAL THICKNESS BURN TO THIGH/ABDOMEN.
80	150641734	6/2015	10 MOM	10MOM PULLED [REDACTED] FULL OF HOT WATER USED TO WARM BOTTLES AT DAYCARE DOWN ON HIMSELF; SCALD BURN INJURIES OF FACE, CHEST, ABDOMEN
81	151056950	10/2015	18 MOM	18 MOM PULLED DOWN HOT WATER FROM A [REDACTED] COFFEE MAKER IT SPILLED ON L LOWER ARM CHEST AND ABDOMEN DX 1ST DEGREE BURN
82	151111718	10/2015	2 YOM	2 YO M PT GRABBED THE [REDACTED] FULL OF HOT FOOD PULLED IT DOWN ONTO SELF, BURNS UPPER TRUNK DX 2ND,3RD DEGREE BURN TRUNK ADMIT
83	151111718	10/2015	2 YOM	2 YO M PT GRABBED THE [REDACTED] FULL OF HOT FOOD PULLED IT DOWN ONTO SELF, BURNS UPPER TRUNK DX 2ND,3RD DEGREE BURN TRUNK ADMIT
84	160303771	2/2016	3 YOM	3 YOM MOTHER WAS HEATING WATER FOR OATMEAL IN A [REDACTED] POT WHEN CHILD PULLED IT ONTO HIM DX 20% PARTIAL THICK BURNS CHEST ABD ARMS
85	160542320	5/2016	5 YOM	5YOM-C/O BURN TO UPPER PART OF BODY AFTER PULLING COFFEE PRESS MACHINE ON HIM AND SPILLING HOT COFFEE DX: BURN UPPER TRUNK
86	160830141	7/2016	17 YOF	17YOF- PT GOT UP FROM TABLE, TRIPPED OVER A CORD & PULLED A POT OF HOT BEAN W/ LIQUID SPLASHED ONTO R FOOT & L KNEE. DX - 1ST DEGREE BURNS.
87	160934925	9/2016	14 MOM	14 MO M PULLED POWER CORD TO DEVICE THAT HEATS LIQUID AIR FRESHENER & HOT LIQUID SPILLED. DX: FACIAL BURN.

88	161000368	9/2016	19 MOM	19MOM AT A HOTEL PULLED THE CORD FOR A COFFEE MAKER THAT HAD HOT WATER IN IT AND IT SPILLED ONTO LOWER ABDOMEN SCALD BURNS TO LOWER ABDOMEN
89	161062193	10/2016	2 YOF	2 YOF PULLED CORD ON COFFEE MAKER PULLING COFFEE POT DOWN ON HEAD SPILLING HOT COFFEE DX 1ST DEGREE BURN OF SCALP
90	161139702	11/2016	19 MOM	19 MOM CLIMBED ON TABLE PULLED COFFEE POT OFF HOLDER HOT COFFEE SPILLEDON KNEES DX 1ST DEGREE BURN BILATERAL KNEES
91	161242517	11/2016	4 MOF	4 MOF REACHED OUT AND GRABBED [REDACTED] WHILE IN ARMS OF HER AUNT. DX: BURN FINGERS.
92	170106753	12/2016	5 YOM	5YOM BURN FOOT, THIGH, WRIST, ANKLE, CHEST PULLED [REDACTED] FULL OF BROTH AND BEEF OFF TABLE ONTO HIMSELF
93	170304068	1/2017	40 YOM	40YOM W/BURN TO HAND 2/2 GRABBED DEEP FRYER THAT HAD CAUGHT FIRE. BURN TO FOOT FROM HOT GREASE SPILLED ON FOOT. UNK IF FIRE DEPT PRES.
94	170219370	1/2017	9 MOM	9 MONTH OLD M WITH A THERMAL BURN TO R THIGH WHEN PULLED A CORD TO A STEAMER COOKER
95	170355027	2/2017	9 MOF	9MOF PULLED A [REDACTED] FULL OF HOT BEEF STEW OFF THE KITCHEN ISLAND ONTO HERSELF AT HOME; 2ND DEGREE BURNS OF FACE, ARMS, LEGS
96	170424862	4/2017	15 MOF	15MOF PULLED COFFEE MAKER OFF COUNTER WHILE IT WAS MAKING COFFEE; DX BURNS FACE AND BACK AND ARMS
97	170506921	4/2017	6 MOM	6 MOM 2ND DEGREE SCALD BURN FACE, W/ BABYSITTER WHEN HE PULLED THE CORDTO ELECTRIC TEA KETTLE SPILLING HOT WATER ON HIS FACE
98	170556865	5/2017	6 YOM	6 YOM RUNNING AT HOME TRIPPED PULLED A HOT [REDACTED] ONTO HIS CHEST DX 1ST DEGREE BURN CHEST
99	170572299	5/2017	2 YOM	2 YOM WAS JUMPING OFF A STOOL & HIS LEG CAUGHT THE CORD TO COFFEE MAKERPULLING IT & SPILLING HOT COFFEE ONTO NECK & UPPER BACK DX BURN
100	170659032	6/2017	8 MOM	8MO M INJ. FACE & CHEST WALL AT HOME WHEN PULLED A POT OF HEATED AROMA WAX ONTO SELF. DX; 1ST.DEG BURN FACE / 1ST.DEG.BURN CHEST WALL.
101	170810618	7/2017	3 YOM	3 YOM GRABBED AN ELECTRIC HOT POT. DX: BURN R HAND/FINGERS SECOND DEG.
102	170854576	8/2017	20 MOM	20MOM W/ DAD EVAL R LATERAL LOW LEG, 2ND DEG OPEN BLISTERS, PT PULLED [REDACTED] OFF COUNTER ON TO LIS R LOW LEG,1 HR PTA DX BURN R LEG,2ND DEG
103	171026077	10/2017	13 MOF	13 MO F SITTING IN WALKER PULLED RICE COOKER CORD & HOT RICE LANDED ONPT. DX: 20% PT & 5% FULL THICK BURNS ABDOMEN, THIGHS, HAND, WRIST.
104	171037792	10/2017	13 MOM	13 MO M WAS COOKING IN ELECTRIC WOK WHEN PT PULLED CORD & SPILLED HOT WATER. DX: 10% TBSA BURNS 2ND DEG FACE, NECK, CHEST, ARM.
105	180125385	12/2017	15 MOF	15MOF BURN ABD/ CHEST SITTING IN HIGHCHAIR REACHED FOR NEAR BY [REDACTED] CORD PULLED OFF COUNTER HAS SPLASH BURN
106	180127066	1/2018	2 YOF	2 YOF PULLED [REDACTED] OFF COUNTER WITH HOT FAJITA DINNER IN IT BUNRS TO NECK AND SHOULDER AT HOME DX 2ND DEG BURNS RT NECK AND SHOULDER;

107	180149801	1/2018	11 MOM	11MOM PULLED THE CORD OF A [REDACTED] FULL OF BEEF DISH AT HOME AND IT DUMPED ON TOP OF HIM; BURN OF TORSO AND RIGHT ARM/LEG
108	180209368	1/2018	4 YOF	4YOF SIBLING PULLED CORD OF [REDACTED], SPILLED HOT LIQUID ON PT; FACIAL BURNS, CHEST BURNS
109	180222569	2/2018	14 MOM	14MOM W/BURNS TO LEFT FACE & NECK FROM HOT WATER THAT SPLASHED ON HIM WHEN HE PULLED THE CORD OF RICE COOKER AT HOME.
110	180444062	3/2018	3 YOM	3YOM PRESENTED TO ED WITH BURNS FROM HOT FOOD AFTER PULLING OVER A [REDACTED].10%BSA 1ST/2ND DEGREE TO BACK/SIDE OF FACE/DX:BURN
111	180432037	4/2018	11 MOF	11MOF IN HIGH CHAIR, BEING PUSHED AROUND BY 2YO SISTER, WHEN SHE PULLEDA POT OF HOT COFFEE ON HER; DX: BURN LEFT UPPER ARM, TRUNK, AND THIGH
112	180428425	4/2018	61 YOM	61 YOM WAS PULLING [REDACTED] FULL OF SOUP CLOSER WHEN CORD CAUGHT & IT SPILLED. DX: SUPERFICIAL & PT BURN L HAND/FINGERS.
113	180457645	4/2018	17 MOF	17 MOF SCALD BURN UPPER ARM, FACE, LIPS AND TONGUE, PULLED ON THE ELECTRIC CORD OF DEEP FRYER WHEN HOT GREASE SPLASHED ON HER
114	180528502	5/2018	10 MOF	10 MOF PULLED A HOT COFFEE POT ONTO ARM. DX BURN
115	180702451	6/2018	13 MOM	13 MO M WAS PLAYING W/CORD ON RICE COOKER & PULLED IT DOWN W/HOT WATER SPLASHING. DX: PT BURN L THIGH 2-3% TBSA.
116	180842978	8/2018	7 YOF	7YOF SUFFERED BURN TO LEFT CHEST WHILE TRYING TO PULL A HOT [REDACTED] OFF THE COUNTER 3 DAYS AGO DX: 2ND DEGREE BURN OF CHEST WALL
117	190210648	1/2019	2 YOM	2YOM W/SCALD BURNS TO RIGHT UPPER ARM & LOWER LEFT LEG AFTER PULLED A [REDACTED] OF PEAS DOWN OFF THE COUNTER AT HOME
118	190402960	3/2019	16 MOM	16 mom pulled cord on rice cooker causing it to tip over & pt was splashed.DX: PT burn R arm.
119	190340550	3/2019	19 MOF	19MOF-PT STEPPED ONTO A STEP STOOL & PULLED OFF COUNTER, FRENCH PRESS HOT COFFEE DOWN ONTO CHEST. CHIN & EYE. MOM REMOVED CLOTHING. DX-DEEP PARTIAL THICKNESS BURN OF TORSO.
120	190549989	4/2019	2 YOM	2yom pulled a [REDACTED] of boiling water on self, burn to thigh. DX: burn
121	190731849	7/2019	12 MOM	12mom 2 weeks ago pulled sister curling iron down onto his R thigh by pulling on the power cord. dx thigh burn
122	190906195	8/2019	17 MOM	17mom pulled a [REDACTED] coffe machine from the counter causing a cup of boiling water to fall on his chest; dx burn chest wall
123	191064502	10/2019	17 MOM	17mom pulled coffee pot down on self, unwitnessed by parents. Dad heard it & saw pt w/ coffee spilled on arm DX superficial burn of back of L hand
124	191110186	10/2019	12 YOF	12yof presents with thermal burns to foot after stepping on electric cord. Pt states felt the shock immediately jumped on table. States had sensation up to thigh. DX: Electrical burn to foot
125	191112482	11/2019	21 MOM	21 MOM PULLED A FRENCH PRESS OF HOT WATER OVER SPILLING ONTO HIS LEFT FOOT, DX: 2ND DEGREE BURN FOOT
126	191249880	11/2019	8 MOM	8mom pulled the cord of an electric kettle and boiling water spilled on left forearm/wrist and left great toe. DX: scald burns.

127	200105185	12/2019	22 MOM	22 mom pulled a rice cooker with boiling water down onto himself burning R upper extremity and face. DX: Partial thickness burn RUE and face.

Burn Injuries due to Appliances Pulled from Counters - All Ages*

1/1/1991 - 12/31/1998*

*Based on reports entered into CPSRMS no later than 5/25/21. The below spreadsheet excludes incidents that were submitted in a previous data request of the same types of incidents; that previous request covered a time frame of 1/1/1999 - 12/31/2019. No incidents involving the requested incident type were found post-2011 in CPSRMS.

Deaths are shown in **bold** font.

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#	Document Number(s)	Date	Age/Sex	State	Narrative
1	C91A5044A	03/1991	3 YOF	PA	A 3 YEAR OLD FEMALE WAS SEVERELY BURNED BY PULLING A [REDACTED] OFF A KITCHEN COUNTER BY THE CORD HANGING DOWN.
2	**9318010090 940926CCC2773**	**12/1992**	**8 MOF**	**IN**	**THE 8 MONTH OLD FEMALE VICTIM DIED FROM 3RD DEGREE BURNS TO 27% OF OF HER BODY SKIN AREA WHEN SHE GRABBED THE CORD OF A FRYER FILLED WITH HOT GREASE, THAT WAS SITTING ON TOP OF A KITCHEN COUNTER TOP IN HER HOME, AND PULLED FRYER ON TOP OF HER. HOT GREASE SPILLED ON HER HEAD, CHEST, AND ARMS. THE VICTIM WAS TAKEN TO THE EMERGENCY ROOM WHERE SHE DIED 3 DAYS LATER.**
3	N9390130A	08/1993	9 MOM	FL	A 9 MONTH OLD MALE WAS SERIOUSLY INJURED BY HOT GREASE WHEN HE PULLED THE CORD TO AN ELECTRIC FRYING PAN CAUSING IT TO TOPPLE.
4	G93A0158A	10/1993	20 MOF	MI	A 20 MONTH OLD FEMALE WAS SERIOUSLY BURNED AFTER PULLING A DEEP FRYER FULL OF HOT GREASE OFF A COUNTER ON HER.

5	C9725019A	05/1994	8 MOF	MI	AN 8 MONTH OLD FEMALE WAS BURNED ON HER HEAD, NECK AND ARMS OPERATING A BABY WALKER WHEN SHE WENT TO THE KITCHEN AND GRABBED AN ELECTRIC SKILLET AND PULLED IT ONTO HER HEAD WHILE HER AUNT WAS ANSWERING THE TELEPHONE.
6	971215HCC1736	05/1994	8 MOM	VA	AN 8 YEAR OLD MALE RECEIVED SEVERE SCALD BURNS FROM HOT OIL IN A DEEP FAT FRYER. THE CHILD WAS IN HIS BABY WALKER WHEN HE GRABBED THE FRYER'S POWER CORD AND PULLED THE FRYER OFF THE COUNTER SPLASHING HIMSELF WITH THE HOT OIL. SINCE THE INCIDENT THE CHILD HAS UNDER GONE EXTENSIVE MEDICAL TREATMENT FOR HIS BURNS.
7	**9442126535** **970528HCC1256**	**11/1994**	**9 MOM**	**PA**	**A 9 MONTH OLD MALE WAS IN A WALKER AND SOMEHOW TRAVELED TO AREA NEAR KITCHEN COUNTER. HE WAS ABLE TO GRAB THE POWER CORD OF AN ELECTRIC DEEP FRYER AND PULL THE DEEP FRYER OFF OF THE COUNTER. THE HOT OIL INSIDE POURED ONTOTHE VICTIM. HE WAS TAKEN TO BURN UNIT OF A LOCAL HOSPITAL, WHERE HE DIED 3 WEEKS LATER OF HIS INJURIES.**
8	**X94C0848A**	**11/1994**	**9 MO**	**PA**	**A 9 MONTH OLD CHILD DIED AFTER PULLING ON THE CORD OF AN ELECTRIC SKILLET CAUSING HOT GREASE TO FALL ON HER.**
9	H95A0254A	02/1995	6 MOM	PA	A 6 MOM SUFFERED A SERIOUS UPPER BODY BURNS FROM HOT OIL IN A DEEP FR YER THAT SPILLED ON HIM AFTER HE PULLED ON THE CORD OF THE FRYER.
10	**9529017926**	**06/1995**	**2 YOM**	**MO**	**PATIENT PULLED LOT-GREASE FROM FRYER OFF OF COUNTER TOP ONTO HIS BACK - MULTISYSTEM ORGAN FAILURE TO INCLUDE RENAL, RESPIRATORY & LIVER FAILURE; ACUTE RESPIRATORY DISTRESS FAILURE/ SYNDROME - SEPTIC SHOCK SYNDROME - AUTOPSY NO**

11	971031HEP9002	03/1996	6 MOM	TX	A 6 MONTH OLD MALE WHILE SITTING IN HIS HIGH CHAIR SUFFERED 2ND DEGREE BURNS TO HIS LEG WHEN HE PULLED THE CORD OF DEEP FAT FRYER THAT HAD JUST BEEN UNPLUGGED. THE VICTIM WAS TAKEN TO THE EMERGENCY ROOM AND TREATED AND RELEASED THE SAME DAY.
12	G9650023A 971103HCC2098	04/1996	6 YOF	NE	A GIRL, AGE 6, WAS SEROUSLY BURNED AFTER SHE ACCIDENTALLY PULLED A DEEP FAT FRYER OFF A COUNTER.
13	F9660044A	05/1996	14 MO	AZ	THREE TODDLERS, TWO AGED 14 MONTHS AND ONE AGE 10 MONTHS, WERE BURNED BY HOT WATER WHEN THEY PULLED A [REDACTED] USED TO HEAT BABY BOTTLES OFF A TABLE AT A DAY CARE CENTER. ONE STAYED IN THE HOSPITAL, TWO WENT HOME.
14	971031HEP9009	05/1996	3 YOM	IL	A 3 YEAR OLD MALE SUFFERED 1ST DEGREE BURNS TO THE UPPER RIGHT PART OF HIS BODY WHEN HE PULLED A CORD OF AN ELECTRIC DEEP FAT FRYER, SPILLING THE HOT GREASE ON HIMSELF AND HIS TWIN BROTHER. THE VICTIM WAS TREATED AND RELEASED THE SAME DAY.
15	N9740171A 971209HCC1724	03/1997	7 MOM	FL	A 7 MONTH OLD MALE SUFFERED 2ND AND 3RD DEGREE BURNS TO OVER 45% OF HIS BODY WHEN HOT OIL FROM A DEEP FAT FRYER SPILLED ON HIM. THE CHILD WAS REPORTED TO HAVE PULLED ON THE FRYER'S POWER CORD, WHICH PULLED THE FRYER OFF A COUNTER, SPILLING ITS CONTENTS ONTO THE CHILD. THE INCIDENT OCCURRED IN THE KITCHEN OF THE CHILD'S HOME.
16	980126HEP9002	07/1997	11 YOM	MI	AN 11 MONTH OLD MALE SUFFERED 1ST AND 2ND DEGREE BURNS TO HIS LEFT SIDE, ARM, AND UPPER THIGH FROM HOT GREASE. THE VICTIM PULLED ON THE CORD OF A DEEP FAT FRYER, SPILLING THE HOT GREASE ON THE VICTIM. THE VICTIM WAS TAKEN TO THE EMERGENCY ROOM AND ADMITTED. HE SPENT TWO NIGHTS IN THE HOSPITAL.

Burn Injuries due to Appliances Pulled from Counters - All Ages

1/1/1991 - 12/31/2006*

*Based on reports entered into NEISS no later than 5/25/21. The below spreadsheet excludes incidents that were submitted in a previous data request of the same types of incidents; that previous request covered a time frame of 1/1/1999 - 12/31/2019. Due to limitations in the previous search, incidents that occurred between 1999-2006 were not able to be included in the previous request, but are included below.

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#	nek	Date	Age/Sex	Narrative
1	910107987	01/1991	11 MOM	PULLED [REDACTED] FULL OF HOT LIQUID ONTO CHEST.
2	910106812	01/1991	10 MOM	PT GRABBED CORD AND PULLED COFFEE POT DOWN, HITTING AND BURNING THIGH.
3	910112220	01/1991	22 MOF	PT PULLED DOWN ELECTRIC COFFEE POT ON SELF - BURN 15-20% LEFT ARM AND LEG
4	910113347	01/1991	12 MOM	TO ED PER FAMILY MEMBER . PULLED DEEP FRYER FILLED WITH HOT OIL OFF COUNTER ONTO SELF 2ND DEGREE BURNS 60 PER CENT BODY/BURN CENTER BY AIR
5	910209402	02/1991	12 MOF	BURNS TO FACE AFTER PULLING A PORTABLE ELECTRIC TEAPOT FULL OF HOT WATER OFF A TABLE ONTO HERSELF.
6	910306463	03/1991	11 MOM	2ND & 3RD DEG. BURNS TO EXTREMITIES-PULLED PERCOLATOR FROM COUNTER SPILLING HOT WATER ON SELF
7	910306467	03/1991	14 MOM	SCALD BURNS TO LT. LEG & RT. ARM-PULLED [REDACTED] OFF COUNTER
8	910317847	03/1991	9 MOM	IN A WALKER,PULLED ON TELEPHONE CORD WHICH TIPPED OVER A [REDACTED]; HOTWATER SCALDED CHEST, ARMS, WRISTS, HANDS (15% OF BODY)
9	910316982	03/1991	8 MOM	PULLED [REDACTED] OFF COUNTER ONTO CHEST SUSTAINING SCALD BURNS.
10	910318336	03/1991	7 MOM	PULLED DEEP FRYER BY THE CORD ONTO HIMSELF SUSTAINING LOWER TRUNK BURNS.

11	910402999	03/1991	17 MOM	PULLED [REDACTED] OF HOT FOOT OFF TQBLE ONTO SELF FIRST AND SECOND DEGREE BURNS FACE AND CHEST
12	910419203	04/1991	5 YOM	TRIPPED OVER AN ELECTRIC COFFEE POT CORD. COFFEE SPILLED ONTO JACKET CAUSING BURNS TO LOWER BACK,BUTTOCKS AND EAR./THERMAL BURNS.
13	910718645	07/1991	15 MOM	PT PULLED [REDACTED] THAT WAS ON TABLE BY CORD AND HOT WATER SPILLED ON ARM
14	910723814	07/1991	12 MOM	PULLED COFFEE POT ONTO SELF / BURNS TO LOWER BACK
15	910811245	08/1991	10 MOM	CHILD PULLED A HOT [REDACTED] OF FOOD OFF COUNTER ONTO SELF 1 & 2ND DEGREE BURNS FOOT ABD ANKLE
16	910910717	09/1991	3 YOM	PT AT HOME THIS PM PULLED HOT ELECTRIC SKILLET FULL OF TURKEY GRAVY ONTO PT CHEST & ARM-1 & 2ND DEG BURNS CHEST & ARM CONSISTANT WITH MECHANIS
17	911118961	09/1991	9 MOM	PT PULLED CORD TO COFFEE POT AND SPILLED HOT COFFEE ON FOOT-1ST AND 2ND DEGREE BURNS OF FOOT-1%BSA
18	911204206	11/1991	11 MOM	11 MONTH OLD MALE PULLED ELECTRIC SKILLET OFF STOVE AND THEN FELL INTO THE SKILLET. DX: BURN HAND
19	920110140	01/1992	12 MOM	PULLED CORD OF COFFEPOT WITH OFFEE DX 2ND DEG BURN L THIGH
20	920109790	01/1992	5 MOF	CHILD IN WALKER GOT CORD OF ELECTRICK SKILLET FULL OF HOT GREASE TANGLED IN WALKER AND PULLED OVER ON CHILD 2ND DEGREE BURNS CHEST HAND ANKLE
21	920217770	02/1992	17 MOM	BURNS TO FACE BY HOT GREAZSE - TRIPPED OVER CORD GOING TO ELECTRIC SKILLET (PULLED HOT GREASE OFF). DX 2 & 3 DEGREE BURNS TO FACE
22	920300988	02/1992	7 MOM	PT PULLED HOT POTPOURRI FULL OF SCALDING WATER ONTO BODY & FOREARM. DX; 1 DEG BURNS L. LATERAL ABDOMEN, THIGH & FOREARM.
23	920401834	03/1992	7 MOF	2ND DEGREE BURN LEFT ARM; PATIENT PULLED THE CORD ON A LARGE COFFEE POT AND HOT COFFEE SPILLED ON HER.

24	920728169	07/1992	17 MOF	MINOR BURN OF HAND,ARM,LEG; PULLED ON CORD ATTACHED TO ELLECTRIC FRY PAN,1ST DEGREE BURNS.
25	921017319	10/1992	13 MOM	PT GRABBED ELECTRIC CORD FROM DEEP FRYER WITH HOT GREASE PULLED IT ONTO FACE, 1ST DEGREE BURNS
26	921017702	10/1992	10 MOF	PT. GRABBED CORD OF DEEP FRYER SPILLED OVER ON PT, PT HAD NO CLOTHES ONONLY DIAPER BURNS OF ALL EXTREMITIES CHEST ABD FACE. DX. 2 DEGREE BURNS
27	921120292	11/1992	4 YOM	BURN. WAS PLAYING WITH FRIEND IN GUEST ROOM AND FRIEND PULLED ELECTRIC COFFEE POT SPILLING HOT WATER ON PT.'S FACE CAUSING BURN.
28	921210054	12/1992	13 MOM	PT WITH L LEG BURNS IN KITCHEN WITH MOM WHO TURNED HER BACK PT PULLED CORD TO COFFEE POT SPILLING COFFEE ON LEG, BURNS
29	930211000	02/1993	16 MOM	BURN.PT. PULLED CORD TO TEAPOT AND HOT TEA SPILLED ONTO PT.'S PAJAMAS. PT. SUSTAINED BURN TO SHOULDER.
30	930407948	04/1993	7 MOF	BURN. PULLED CORD OF SKILLET WITH HOT BUTTER IN IT WHILE IN WALKER. SUSTAINED BURNS TO CHEST AND HAND.
31	930609009	06/1993	23 MOF	SECOND DEGREE BURNS TO CHEST, LEFT THIGH - PER MOM CHILD CLIMBED ON KITCHEN TABLE AND PULLED ON CORD OF COFFEE POT - SPILLED HOT COFFEE ON SEL
32	930614974	06/1993	10 MOF	PULLED CORD OF FRYING PAN FULL OF HAMBURGER HELPER OFF THE STOVE ONTO HER LEGS; LEG BURNS
33	930618254	06/1993	11 MOM	PARTIAL THICKNESS BURNS BSA 15% MOM STATES CHILD PULLED HOT POT OF HOT WATER OFF COUNTER BY ELECTRIC CORD
34	930716903	07/1993	15 MOF	10% BURN TO FACE,EARS,CHEST,BACK-PT. PULLED CORD OF ELECTRIC FRYING PANSPILLING HOT OIL ON SELF
35	930807368	08/1993	12 MOM	BURNS TO LT LOWER ARM-PT PULLED A COFFEE POT ONTO HIMSELF

36	930903453	09/1993	6 MOF	BODY BURNS-PT WAS IN WALKER-PULLED CORD OF ELECTRIC FRYING PAN-DX:2ND DEGREE BURNS 20-23% BSA TO LT BACK LT LEG ABD/CONTUSION TO SCALP
37	931016687	10/1993	2 YOM	PULLED POTPOURRI POT OVER ON HIM, BURNED SCALP
38	931114727	11/1993	10 MOF	CHILD WAS IN WALKER AND PULLED [REDACTED] CORD,POT FELL OFF TABLE,HOT WATER BURNS TO THIGH,NECK,SHOULDER,THIGHS
39	931205646	12/1993	14 MOM	PT PULLED ON CORD OF SLOW COOKER THAT HAD HOT STEW IN IT; COOKER FELL BURNING PT WITH HOT STEW. DX; 1 & 2 DEG BURNS BOTH ARMS & TORSO.
40	940112323	01/1994	2 YOF	2 1/2 YEAR OLD FEMALE PULLED AN ELECTRIC POTPOURRI [REDACTED] OVER ON HER, SUFFERING 2ND DEGREE BURNS OVER CHEST AND LEGS. TRANSFER/BURN CENTER.
41	940205982	02/1994	12 MOM	SCALD BURN TO FOREHEAD,LT. ARM,CHEST,FACE,EAT-CHILD SITTING IN HIGH CHAIR PULLED CORD OF PERCOLATOR
42	940212600	02/1994	12 MOM	BURNS TO FACE-PT WAS SITTING IN HIGH CHAIR & PULLED [REDACTED] OFF COUNTER THAT HAD A ROAST,WATER & RICE IN IT DX:1ST/2ND DEGREE BURNS TO FACE
43	940422276	04/1994	2 YOM	BURN OF FACE. PULLED ELECTRIC SKILET FILLED WITH HOT GREASE ON SELF.
44	940514330	05/1994	12 MOM	INJURED PULLING COFFEE POT ON FACE, NECK, CHEST / BURNS TO FACE, EAR, CHEST
45	940527296	05/1994	12 MOF	BURN. PULLED CORD OF ELECTRIC COFFEE POT SPILLLING HOT WATER ON SELF BURNING CHEST.
46	940607783	06/1994	11 MOM	BURN. PULLED CORD ON ELECTRIC HOT POT AND HOT WATER SPILLED ON PT. BURNING SHOULDER, ARM, THIGH.
47	940620114	06/1994	8 YOF	PT PULLED ELECTRIC FRY PAN OFF COUNTER & SUSTAINED BURNS TO BOTH FEET FROM HOT GREASE.DX; 1ST & 2ND DEG BURNS L. FOOT.
48	940630258	06/1994	15 MOM	BURN. PULLED FRYING PAN WITH HOT GREASE IN IT OFF STOVE ONOT SELF BURNING CHEST, ARM, ABDOMEN, LEG.

49	940712519	06/1994	9 MOM	SAID TO HAVE SUSTAINED BURNS TO HANDS, FACE AND THIGH WHEN HE PULLED A RICE COOKER OFFTHE COUNTER AND THE HOT WATER SPLASHED ON HIM. E924.0
50	940802276	07/1994	10 MOM	PT WAS CRAWLING AND PULLED A CORD OF ELECTRIC FRYING PAN, CAUSING GREASE BURNS TO HAND, ARM, THIGH AND LEG
51	940923906	09/1994	7 MOM	PT PULLED A COFFEE POT FILLED WITH HOT WATER DOWN OFF OF COUNTER BY THE ELECTRICAL CORD-SUFFERED SCALD BURNS TO RT UPPER CHEST
52	941123436	11/1994	3 YOF	PT WAS PLAYING IN THE KITCHEN WHEN ANOTHER CHILD PULLED HOT COFFEE POT DOWN ON HERSELF. DX 1ST AND 2ND DEGREE BURNS LEFT CHEST.
53	941210777	12/1994	15 MOF	SECOND DEGREE BURNS ASNTERIOR CHEST, ABDOMEN, RIGHT THIGH AND LEFT FOREARM PULLED [REDACTED] OFF COUNTER TOP SPILLING HOT CONTENTS UPON SELF
54	950111211	01/1995	3 YOF	BURNS DUE TO PULLING A FRYING SKILLET OVER
55	950118383	01/1995	11 MOF	CHILD PULLED [REDACTED] FILLED WITH HOT WATER DOWN ON HERSELF. D:BURNS TO CHIN, CHEST AND ARM. ADMITTED.
56	950507554	04/1995	4 YOM	PULLED [REDACTED] OVER ON SELF DX THERMAL BURN
57	950530930	05/1995	6 MOM	6 MO OLD MALE PULLED ELECTRIC SKILLET OFF COUNTER TOP SUSTAINING BURNS TO FACE
58	950807703	08/1995	13 MOM	PULLED CORD OF TEAKETTLE AT HOME AND HOT WATER SPILLED ON SHOULDER NECK. DX: 2ND DEGREE BURNS TO NECK/ RIGHT SHOULDER.
59	950828740	08/1995	8 MOF	/PT PULLED ELECTRIC SKILLET CONTAINING FOOD ONTO HER FACE BY PULLI NG CORD; 1ST AND 2ND DEGREE BURN FACE
60	951033146	10/1995	2 YOM	DX FOOT BURNS; PULLED [REDACTED] FULL OF HOT WATER ON TO HIMSELF AND BURNED HIS FEET
61	960110203 971031HEP9004	01/1996	12 MOF	PT. PULLED THE CORD OF A PORTABLE FRYER UNIT AND IT SPILLED CONTEN TS SUSTAINED GREASE BURNS TO UPPER TRUNK, FACE AND NECK. E924.0
62	960305568	02/1996	4 YOF	-4 Y/O PULLED THE [REDACTED] DOWN AND DUMPED HOT WATER ON HER. BURNS TO BOTH LEGS.

63	960311782 971031HEP90 02	03/1996	6 MOM	6 MTH OLD MALE SITTING IN A HIGHCHAIR, PULLED ON CORD OF A [REDACTED] AND SUSTAINED A LEFT UPPER LEG BURN WHEN HOT GREASE SPLASHED.
64	960314842	03/1996	2 YOM	PT PULLED OVER A SLOW COOKER INTO FACE FILLED WITH HOT WATER. D X-BURNS/SCALDS 15% FACE
65	960416677 960419HEP90 04	03/1996	17 MOM	FAMILY JUST FIXED DINNER, PT PULLED [REDACTED] FULL OF GREASE OFF STOVE ONTO HIM,PARENTS PUT IN SHOWER, BURNS TO FACE, NECK AND LT SIDE
66	960424201	04/1996	18 MOM	18M/O M PULLED AN ELECTRIC CORD. THE HOT POT AND HOT WATER FELL & BURNED HIM. DX: 5X5CM BURNS BILATERAL FEET.
67	960502826	04/1996	8 YOF	PT TRYING TO GO UNDER CORD OF FRYING SKILLET, PONYTAIL GOT CAUGHT,PULLED PAN OF GREASE ONTO HER, 2ND DEG BURN LT SHOULDER/UPPER ARM
68	960505549	05/1996	51 YOM	PATIENT VISITING GRANDMOTHER PULLING COFFEE POT OVER ON SELF / BURNS TO UPPER ARM
69	960530487 971031HEP90 10 971119HEP90 03	05/1996	2 YOM	10% BSA 1ST AND 2ND DEGREE BURNS LT TORSO-PULLED [REDACTED] FULL O F HOT GREASE ON HIMSELF AND BROTHER
70	960530488 971031HEP90 09	05/1996	3 YOM	5% BSA 1ST DEGREE BURNS RT NECK/SHOULDER-PULLED [REDACTED] FULL OF HOT GREASE ON HIMSELF AND BROTHER
71	960629260	06/1996	18 MOM	PT. PULLED AN ELECTRIC KETTLE DOWN FROM THE KITCHEN COUNTER POURIN G BOILING H2O ONTO HIS LEGS SUSTAINED SCALD BURNS TO LEGS. E924.0
72	960727217	07/1996	14 MOM	9% SCALD BURN TO LT. SIDE FACE,RT. UE AT JOINT,RT. ANTERIOR CHEST -CHILD TRIPPED OVER CORD TO ELECTRICAL FRYER ON TABLE SPILLING HOT OIL
73	960734977	07/1996	3 YOF	PATIENT PULLED [REDACTED] OF HOT CHEESE ON SELF / BURNS TO CHEST
74	960800495	07/1996	15 MOF	2ND DEG BURN TO TRUNK AND LEGS, PT PULLED AN ELECTRIC SKILLET OVE R AND SUSTAINED GREASE BURNS TO ANTERIOR ABDOMEN, FEET, & KNEES
75	960808093	08/1996	10 MOF	CHILD AT HOME PULLLED AN ELECTRIC FRY PAN ON TO HEAD AND BURNED SCALP. DX: SCALP BURNS

76	960822310	08/1996	16 MOF	PT PULLED [REDACTED] OF STRING BEANS ONTO SELF DX-11% PARTIAL THICK NESS BURNS TO RIGHT SIDE OF BODY
77	961008783	10/1996	5 YOM	CHILD PULLED ELECTRIC CORD OF POT AND BEANS & HOT WATER SPILLED ON HIM. D:BURNS TO HAND, FOREARM AND THIGH.
78	961027532 971031HEP9003	10/1996	13 MOM	BURNED FOOT WHEN PULLED FRYER SPILLING GREASE
79	961209286	11/1996	2 YOF	PT. PULLED THE OF COFFEE POT HEATING WATER WHICH TUMBLED OVER & SP ILLED HOT WATER ONTO PT. SUST. 20% SCALD BURNS TO CHEST/FACE. E924.0
80	970224330	11/1996	2 YOF	BURN LEGS LOWER AND UPPER PULLED [REDACTED] WITH BOILING FOOD AND WATER OVER ON HER E9242
81	970113228	01/1997	4 YOM	BURN. PT. PULLED CORD OF [REDACTED] AND POT SPILLED HOT SOUP ON PT. CAUSING 2 DEGREE BURNS TO FACE, NECK, CHEST.
82	970123448	01/1997	16 MOM	-16 MONTH OLD MALE PULLED [REDACTED] ON SELF AND SUSTAINED PARTIAL T HICKNESS BURNS TO CHEST.
83	970128595	01/1997	6 YOM	CHILD PULLED HOT [REDACTED] OF BEANS OVER ONTO SELF BURNING CHEST, BACK AND SHOULDER
84	970226964	02/1997	14 MOM	BABY SITTER - CHILD PULLED [REDACTED] OF HOT GREASE OFF CABINET ONTO FEET. DX: 2 BURN TO L. FOOT.
85	970223501	02/1997	2 YOM	BURN. PULLED CORD OF ELECTRIC KETTLE WITH HOT WATER IN IT. PT. SU STAINED SCALD BURNS TO HAND, TORSO, AND THIGH.
86	970414598	04/1997	9 MOF	DX 2ND DEGREE BURNS TO HEAD AND RIGHT ARM: PULLED CORD OF HOT P OT OFF ONTO SELF AT HOME.
87	970427527	04/1997	12 MOM	BURN. PULLED CORD OF PERCULATOR AND HOT WATER SPILLED ON PT. CAUS ING 2 DEG. BURNS TO BACK AND LEGS.

88	970510012	05/1997	11 YOM	PT RUNNING, TRIPPED ON A [REDACTED] CORD AND HOT FOOD SPILLED ONTO HIM. THERMAL BURNS LT LOWER LEG
89	970537139	05/1997	2 YOF	- PULLED [REDACTED] FULL OF BEANS ONTO SELF DX: 2ND DEGREE BURNS TO FOOT
90	970537203	05/1997	18 MOM	- PULLED [REDACTED] OFF STOVE, SPLASHING FACE DX: 2ND DEGREE BURN TO FACE
91	970624020	05/1997	2 YOM	PT. GRABBED CORD OF [REDACTED] AND PULLED IT ONTO HIMSELF, SPLASHIN G HOT BROTH ALL OVER HIMSELF, SUST. 7% SCALD BURN TO CHEST. E924.0
92	970925136	09/1997	6 YOM	- PULLED CORD OF [REDACTED] AND IT FELL ON HIM, SPILLING CONTENTS DX: SECOND DEGREE BURN LEFT SIDE
93	970926386	09/1997	12 MOM	- PT. BURNED WHEN [REDACTED] WAS PULL OFF COUNTER SPILLING CONTENS ON CHILD CAUSING 1ST AND 2ND DEGREE BURNS.
94	980101202	10/1997	13 MOM	- PULLED HOT FOOD FROM [REDACTED] ONTO SELF DX: 2ND DEGREE BURN OF 23% TOTAL BODY SURFACE
95	971219978	11/1997	12 MOM	2ND DEGREE BURNS L ARM, L LEG, AND ABD. (3%TBSA), CHILD CAUGHT HO LD OF ELECTRIC CORD AND PULLED SKILLET OFF STOVE.
96	971201652	11/1997	8 MOF	PT. IN KITCHEN W/MOM & PULLED THE CORD OF AN ELECTRIC TEAPOT WITH BOILING H2O FR. STOVE ONTO SELF, PT. SUSTAINED 3% BURN TO CHEST. E924.0
97	971212259	12/1997	2 YOM	PT PULLED HOT COFFEE POT FROM COUNTER AND HAS BURNS TO (R) FOREARM.
98	971219012	12/1997	3 YOF	3YOF PULLED [REDACTED] WITH HOT STEW OVER. BURNS TO LEFT HAND.
99	971219013	12/1997	16 MOM	16MOM RELATIVE PULLED [REDACTED] WITH HOT STEW OVER. BURNS TO RT FOOT.
100	980217361	02/1998	4 YOM	PT. PULLED [REDACTED] OF BEANS ONTO R ARM. NOW W/SEVERE PAIN. DX. 1-2 DEG BURNS R ARM/SHOULDER.
101	980218455	02/1998	6 YOM	1-2 DEGREE BURN R FOREARM & BLISTER UNDER ARM;PULLED [REDACTED] OVE R ONTO HIMSELF.

102	980404736	03/1998	75 YOF	PT UNPLUGGING AN ELECTRICAL APPLIANCE, PULLED ON CORD AND RECEIVED AN ELECTRIC BURN TO RT HAND
103	980505166	04/1998	16 MOM	16 MONTH MALE BURNED FACE AND RIGHT ARM WHEN PULLED CORD OF [REDACTED] OF BEANS OFF STOVE.TX TIME 1712.
104	980524524	05/1998	12 MOM	BURNS E ELBOW, TRUNK,THIGH, CALF & FOOT;PULLED ON CORD & SPILLED HOT COFFEE ON SELF.
105	980604563	05/1998	7 YOM	CHILD PULLED FULL POT OF HOT COFFEE THAT THE CORD WAS HANGING FROM THE DRYER DOWN HIS BACK, 1ST AND 2ND DEGREE BURN TO NECK AND TRUNK
106	980609497	05/1998	8 MOM	PT PULLED DOWN HOT WATER FROM [REDACTED]. 1ST DEGREE BURN TO FINGERS
107	980618321	06/1998	13 MOM	PT PULLED AN ELECTRIC SKILLET FILLED WITH HOT GREASE OFF ON HIMSE LF SUSTAINED 2ND DEGREE BURNS TO OVER 50% OF BODY
108	980928749	09/1998	18 MOF	PULLED [REDACTED] W/ ROAST & BROTH ONTO HERSELF DX BURNS
109	981109414	10/1998	8 MOM	PT. PLAYING IN DINING RM WHEN HE PULLED ELECTRIC CORD ATTACHED TO HOT WATER MAKER SITTING ON TABLE, PT. SUST SCALD BURNS. [REDACTED]
110	981114047	11/1998	2 YOM	2 YOM PULLED DEEP FRYER OVER ON HIMSELF. BURNS TO CHEST.
111	981207757	11/1998	16 MOF	- PULLED ELECTRIC CORD OF SKILLET FILLED WITH HOT WATER, AND IT F ELL OF TABLE ONTO PATIENT DX: THERMAL BURNS TO ARM, LEG AND TRUNK
112	990213034	02/1999	9 MOF	= PULLED ELECTRIC SKILLET ON TO FACE DX 2ND DEGREE THERMAL BURNS TO FACE
113	990309742	02/1999	9 MOM	PT. PULLED A RICE COOKER ONTO SELF WHILE SITTING IN HIGH CHAIR, PT . SUSTAINED PARTIAL THICKNESS BURNS TO LEG & HAND. E917 TIME 19:50.
114	990305819	02/1999	15 YOF	FIRST AND SECOND DEGREE BURN OF R FOREARM - PULLED A [REDACTED] OF HOT WATER ONTO FOREARM

115	990303677	02/1999	3 YOM	PT PULLED COFFEE POT CORD, COFFEE FELL ONTO PTS LAP, BURN TO GROI N, THIGHS, PT TRANSFERRED
116	990406036	03/1999	11 MOM	PT. AT HM WHEN HE PULLED A "[REDACTED]" OIL COOKER FILLED W/HOT OIL IN IT ONTO SELF, PT SUST 35% 2ND/3RD DEG BURNS TO BODY. [REDACTED]
117	990517099	04/1999	5 MOM	2ND DEGREE BURN ON FOREARM-PT PULLED ON COFFEE MACHINE CORD AND COFFEE SPILLED ON CHILDS ARM.
118	990508980	04/1999	10 MOM	PT. PULLED RICE COOKER DOWN FROM COUNTER SPILLING HOT H2O & RICE ONTO SELF AT HOME, PT. SUST. 15% BURNS TO UPPER BODY. E924.0 TIME 19:48
119	990528553	05/1999	7 MOM	FIRST AND SECOND DEGREE BURNS CHEST AND RIGHT ARM, PULLED ELECTRIC SKILLET OFF COUNTER ONTO HIM WHILE IN WALKER
120	990714668	07/1999	49 YOF	PT TRIPPED OVER THE CORD OF THE [REDACTED] IT FELL OFF A COUNTER SPILLING CONTENTS ONTO CHEST SCALD BURNS CHEST
121	990911028	09/1999	6 YOM	1ST DEGREE GREASE BURN LT ANKLE-AT A CAR SHOW-RUNNING-TRIPPED ON A CORD AND PULLED AN ELECTRIC FRYER ONTO HIS ANKLE
122	991023221	09/1999	2 YOM	GRABBED RICE COOKER CORD AND CONNECTED IT ELECTRICAL BURN DX 3RD DEGREE BURN RT THUMB INDEX FINGER AND MIDDLE FINGER
123	991216299 991221HEP90 09	11/1999	2 YOF	2YOBF PULLED A [REDACTED] OF HOT APPLE CIDER DOWN ON HER;2 DEG BURN TORSO, RT LEG, LT ARM
124	991201033	11/1999	22 MOF	L ARM SECOND DEGREE BURN - PULLED ON CORD OF COFFEE MAKER AND HOT COFFEE SPLASHED ON ARM
125	991205278	12/1999	6 YOM	PULLED DEEP FRYER ON HIMSELF/ PARTIAL THICKNESS BURNS NECK AND ABDOMEN
126	991225056	12/1999	10 MOM	10 MONTH OLD MALE PULLED CORD OF [REDACTED] AND PULLED [REDACTED] ON TO HEAD. HEMATOMA FOREHEAD AND CLOSED HEAD INJURY
127	202764	01/2000	3 YOM	3YOM PT ARRIVED BY AMB 2ND DEGREE BURNS R TOP FOOT,CHILD PULLED BOILING WATER FM POTPOURRI [REDACTED] OFF TABLE/2 DEGREE BURN FOOT

128	328454	03/2000	16 MOF	CHILD PULLED [REDACTED] FILLED WITH SPAGHETTI DOWN ON HERSELF. D: 1ST AND 2ND DEGREE BURNS, FOREARM.
129	743499	07/2000	11 MOM	PT PULLED ELECTRICAL WIRE AND [REDACTED] FULL OF BEANS FELL ONTO PT D:ADMIT-PARTIAL THICKNESS BURNS TRUNK/THIGH
130	10433308	04/2001	12 MOM	PATIENT PULLED ELECTRIC SKILLET OVER AND GREASE SPILLED ON PATIENT DX: 2ND DEGREE BURNS TO FACE, HEAD, CHEST, BACK ABDOMINAL WALL, ARM.
131	10846803	08/2001	9 MOM	PULLED CORD OF DEEP FRYER, HOT GREASE SPLASHED. BURNS TO FACE, RT SHOULDER, BACK, HEAD. DX; 2ND DEG BURNS APX 3% BSA
132	10926853	08/2001	2 YOF	PATIENT PULLED DEEP FRYER DOWN ON HER AT HOME; 1ST AND 2ND DEGREE BURNS TO THIGHS, LOWER LEGS, AND FEET
133	10934077	09/2001	3 YOF	PT THREW TOY TOWARDS GARBAGE;CAUGHT FOOT IN ELECTRICAL CORD AND PULLED [REDACTED] ONTO BACK DX: BURNS-1ST AND 2ND TO RT SIDE OF BACK
134	11051512	09/2001	10 MOM	PATIENT PULLED DOWN [REDACTED] SPILLING CONTENTS ON HIM AT HOME; 2N D DEGREE WRIST BURNS
135	20103095	12/2001	12 MOM	PULLED HOT FRYOLATOR DOWN OFF SHELF ONTO HEAD BURNING FOREHEAD;TRA NSFER TO SHRINERS BURN HOSPITAL
136	20142728	01/2002	2 YOF	PT REACHED AND PULLED COFFEE POT CORD SPILLING HOT COFFEE. DX: FIRST AND SECOND DEG BURNS BACK 3% TBSA.
137	20417027	04/2002	2 YOF	2 Y.O. W FEMALE W/MULTI-BURNS. BROTHER PULLED DEEP FAT FRYER W/HOT GREASE DOWN ON BOTH OF THEM @ HOME. E9240
138	20417028	04/2002	17 MOM	17 MON OLD W MALE W/MULTI-BURNS. PT PULLED A DEEP FAT FRYER OFF ONTO HIMSELF & HIS SISTER @ HOME. E9240
139	20441151	04/2002	52 YOM	PARTIAL THICKNESS BURN RT FOOT.PT PT WAS PULLING OUT PAN FROM FRYER AND GREASE SPILLED ON FOOT.

140	20527555	05/2002	17 MOM	PULLED HOT ROAST PAN ONTO HIMSELF- [REDACTED], SPILLING GREASE ON HIM DX: BURNED 8% 2ND 26% 1ST DEGREE
141	20555532	05/2002	3 YOM	PULLED A [REDACTED] OF CHICKEN AND HOT WATER ONTO HIMSELF BURNS TO HEADFACE,SHOULDER'S. DX SCALD BURNS.
142	21031371	10/2002	13 MOM	MOTHER STATES CHILD PULLED [REDACTED] OFF TABLE CHILD WEARING DIAPER @ THE TIME BURNS TO 5.5% BODY SURFACE 2ND DEGREE BURNS-BACK & BUTTOCKS.
143	21023279	10/2002	2 YOF	PULLED ELECTRICAL COFFEE POT FROM COUNTER-HOT WATER SPILLED ON FEET 1ST & 2ND DEGREE BURNS TO FEET
144	30142273	01/2003	53 YOF	DX:BURN TO LEFT THIGH. SPILLED HOT WATER ON SELF WHEN SHE CAUGHT THE CORD OF THE TEA KETTLE AND PULLED IT ON TO HERSELF.
145	30350652	03/2003	13 MOM	PULLED CORD ON COFFEE POT AND SPILLED HOT COFFEE ON R FACE AND TORSO. DX. BURNS FACE, CHEST, ABDM, BACK, R SHOULDER, R ARM, R FOOT.
146	30421971	04/2003	14 MOM	CHILD PULLED CORD OF RICE COOKER DX: THERMAL BURNS TO ARMS
147	30844125	06/2003	14 MOM	14%SCALD BURN TO FACE AND CHEST. PULLED RICE COOKER WILTH HOT WATER OVER ONTO SELF
148	30732844	06/2003	27 YOF	FIRST DEGREE BURN R WRIST AND HAND, UNPLUGGING POT AND POT PULLED OVER SPILLING HOT POTPOURRI ON WRIST AND HAND AT HOME
149	30722702	07/2003	6 MOF	6MO OLD F PULLED HOT HOT [REDACTED] DOWN SPILLING ON MULTIPLE BODY BURN MULTIPE
150	31030175	10/2003	64 YOF	PT PULLED A [REDACTED] OF HOT SOUP ONTO SELF. DX: SECOND/THIRD DEG BURNS BACK 18% TBSA.
151	31023251	10/2003	2 YOM	PT WAS AT GRANDFATHERS HOUSE WHEN HE PULLED AND ELECTRIC TEAPOT FILLED WITH HOT WATER OVER CAUSING 2ND AND 3RD DEGREE BURNS TO BOTH FEET.
152	40114447	01/2004	26 YOF	PT COOKING AT HOME WHEN HER BABY PULLED THE CORD TO AN ELECTRIC FRYER AND THE HOT OIL WENT ONTO BOTH FEET SCALD BURNS TO FEET

153	40114448	01/2004	6 MOM	PT WAS CRAWLING WHEN HE GRABBED THE CORD TO AN ELECTRIC FRYER PULLED ITOVER HOT OIL ON SCALP UPPER BACK FACE ARMS AND BUTTOCKS- SCALD BURNS
154	40142334	01/2004	11 YOM	PT GOT FOOT CAUGHT IN CORD OF [REDACTED] AND PULLED POT DOWN ONTO HIS CHEST, 2% BURNS TO CHEST
155	40504810	04/2004	4 YOM	PT PULLED DEEP FRYER WHICH HAD BEEN OFF FOR 20 MIN. DX: PARTIAL THICKNESS BURN BACK 1%TBSA.
156	41033655	09/2004	8 MOM	PT IN WALKER PULLED ON EXTENSION CORD, WHICH PULLED A RICE COOKERDOWN DUMPING BOILING WATER ON PT. DX: 2ND & 3RD DEG BURNS 30% BODY
157	41033324	10/2004	9 MOM	PULLED THE CORD OF A BOTTLE WARMER THAT HAD HOT WATER IN IT - THE WATERSPILLED ONTO HIM DX: SCALD BURN 2ND DEGREE TO LEFT FOOT
158	41204294	11/2004	15 MOM	PATIENT PULLED [REDACTED] WITH HOT WATER ONTO HIMSELF; 2ND DEGREE INNER THIGH BURN, 1ST DEGREE FOOT BURN
159	41211572	12/2004	2 YOF	PT @ HOME HOT DEEP FRYER WITH COOKING OIL ON STOVE PT PULLED-SPILLED HER GROIN AND LEFT THIGH. MOM IMMED-COLD WATER. DX 2ND DEGREE BURNS.
160	50229868	02/2005	9 MOM	PATIENT PULLED A [REDACTED] WITH CHICKEN BROTH OFF A COUNTER AND BURNED HMSELF. DX-1ST & 2ND DEGREE BURNS TO FACE, SHOULDER AND ABDOMEN.
161	50408599	03/2005	2 YOM	PT TRIPPED OVER COFFEE POT CORD KNOCKING IT OVER AND COFFEE SPILLED OVER FEET, SCALD BURNS FEET
162	50425241	04/2005	21 MOM	PATIENT PULLED COFFEE POT OFF COUNTER AT HOME, BURNED ON FACE, SHOULDER, UPPER ARM; 1ST/2ND DEGREE BURNS
163	50803798	05/2005	12 MOF	DX BURNS TO LOWER LEG: PULLED [REDACTED] ONTO SELF, BURNED BY GRAVEY AT HOME.
164	50815936	08/2005	10 MOM	CHILD PULLED CORD OF [REDACTED] AND THE CONTENTS IN [REDACTED] FELL ONTO CHEST, ABDOMEN, THIGH, FINGER. D: 1ST/2ND DEGREE BURNS.

165	51041372	09/2005	6 YOF	BURNS 2ND DEGREE R FOREARM, PT PULLED A HOT POT OF WATER FROM HER 12YRS OLD SISTER, SPILLED & SUST INJURY, C/O PAIN, REDNESS, BLISTERS.
166	51018831	10/2005	8 MOF	BURN TO LEG AND R HAND, PULLED CORD ON ELECTRIC HOT PLATE, FELL ON HER DX: 1ST & 2ND DEGREE BURNS R LOWER ARM AND R LOWER LEG
167	51102371	10/2005	3 MOM	PATIENT AT DAYCARE, ANOTHER CHILD PULLED [REDACTED] DOWN, HOT WATER SPLASHED ON PATIENT; 2ND DEGREE SHOULDER BURN, 1ST DEGREE BURN TO NECK
168	51104411	10/2005	2 YOM	PATIENT PULLED DEEP FRYER OFF KITCHEN COUNTER AT HOME WITH OIL BURN TO PATIENT, IMMEDIATELY DOUSED IN COLD WATER BY PARENTS; FACIAL BURN, 2%BS
169	60401953	01/2006	5 YOF	PT PULLED KETTLE OF HOT ONTO RT FOREARM C/O PAIN RT FOREARM SCALD BURN
170	60206092	01/2006	17 MOM	1 YR, 5MTH OLD MALE FIRST DEGREE BURNS OVER ENTIRE BODY WHEN PULLED A HOT DEEP FRYER ON HIMSELF.
171	60417047	03/2006	13 MOF	PT WAS @ DAYCARE STANDING ON CHAIR PULLED [REDACTED] WITH HOT H2O ONTOHER BURNS TO RIGHT SIDE. DX 13% PARTIAL THICKNESS SCALD BURNS.
172	60511465	04/2006	9 MOM	PT WAS WALKING AROUND IN WALKER IN KITCHEN PULLED CORD TO [REDACTED] WHICH CONTAINS INSIDE FELL TO CHEST AREA. 3RD DEGREE BURNS. DX BURNS.
173	60538827	05/2006	6 MOM	PT PULLED [REDACTED] AND HOT LIQUID LANDED ON FACE. DX: 2ND DEGREE BURNS TO FACE.
174	60725854	07/2006	12 MOM	VACUUM CORD ON COUNTER AROUND SLOW COOKER, PULLED CORD AND SLOW COOKER WITH ROAST FELL ONTO SELF. DX: 2ND DEGREE BURNS SHOULDER.
175	61220155	12/2006	4 YOF	PT WAS FALLING DOWN AND PULLED ON A CORD OF [REDACTED] IN AN ATTEMPT TO STOP FALLING ; [REDACTED] WITH HOT WATER, CHICKEN AND VEGETABLES FELL ON

Burn Injuries due to Appliances Pulled from Counters - All Ages

1/1/2019 - 12/31/2020*

*Based on reports entered into NEISS no later than 5/25/21. The below spreadsheet excludes incidents that were submitted in a previous data request of the same types of incidents; that previous request covered a time frame of 1/1/1999 - 12/31/2019. An incident that was received in NEISS after 1/17/2020, but occurred within the time frame of the previous request, is also included below.

Disclaimer: CPSC does not guarantee the accuracy, completeness, or adequacy of these data particularly with respect to information submitted by people outside of CPSC. This spreadsheet was prepared by CPSC staff, has not been reviewed or approved by, and may not necessarily reflect the views of the Commission.

#	nek	Date	Age/Sex	Narrative
1	200148684	04/2019	2 YOM	2 yom presents with scald burn to chest aftr he pulled a kettle of hot water causing it to spill on his body. DX: Chest scald burn
2	200250371	02/2020	20 MOM	20mom hot iron was sitting on a dresser and pt pulled the cord and the iron fell off and onto pt R thigh and R hand. dx hand and thigh burn
3	200401423	03/2020	18 MOM	18MOM-FOSTER G-MA WAS COOKING BACON ON AN ELECTRICAL SKILLET WITH PLUGGED INTO THE WALL. PT WAS IN HIS WALKER & PULLED THE CORD. SKILET FELL ONTO PT HEAD & FACE. SCEAMING FOR 1 HOUR. EMS WAS CALLED. DX: PARITAL THICKNESS BURNS OF FACE, FRONTAL SCALP, NECK UPPER CHEST & HANDS.
4	200413096	04/2020	7 MOM	7MOM GRABBED A CORD FROM A KETTLE WHICH WAS BOILING WATER THAT THEN FELL ON HIM DX BURNS TO BACK, LEG, ARM AND PERIORBITAL AREA
5	200432418	04/2020	2 YOM	2 yom coffee pot was on kitchen counter he was trying to pull coffee grounds out of top and pulled coffee pot down on himself spilling entire pot of coffee on chest and l arm dx 2nd degree burn
6	200432384	04/2020	11 MOM	11mom pulled on the cord of a [REDACTED] causing it to fall off counter onto the ground, the child then fell into the hot liquid from the [REDACTED] sustaining burns to right posterior thigh and anterior knee. DX: partial thickness burns to the leg

7	200729555	07/2020	12 MOF	12MOF- MOM WAS WARMING BEANS IN A [REDACTED] WHEN PT PULLED ONTO THE POWER CORD & WATER SPILLED ON HER FOREHEAD & BODY. DX: 2ND DEGREE BURNS OF FOREHEAD,FOREARM & ABDOMEN.
8	201114801	10/2020	15 MOM	15mom pulled a coffee pot full of hot coffee off counter onto himself;dx scald burn injuries to chest, back, abdomen
9	201227073	11/2020	15 MOM	15MOM was in the kitchen and pulled down a slow cooker cord that had soup in it. DX: Thermal burns of multiple sites.
10	201242391	11/2020	21 MOM	21mom dad had made coffee on the [REDACTED] coffee maker child grabebd the cord for the [REDACTED] and pulled it off the counter spileld into face DX: scald burns to face
11	201249540	12/2020	2 YOF	2 yof - mom was cooking broccoli in a rice cooker - pt pulled on the cord and pulled the rice cooker over and spilled hot water on pts upper back and upper arm. dx burns

Public Comment No. 852-NFPA 70-2021 [Section No. 210.52(E)]

(E) Outdoor Outlets.

Outdoor receptacle outlets shall be installed in accordance with 210.52(E)(1) through (E)(3).

Informational Note: See 210.8(A)(3).

(1) One-Family and Two-Family Dwellings.

For a one-family dwelling and each unit of a two-family dwelling that is at grade level, at least one receptacle outlet readily accessible from grade and not more than 2.0 m (6½ ft) above grade level shall be installed at the front and back of the dwelling.

(2) Multifamily Dwellings.

For each dwelling unit of a multifamily dwelling where the dwelling unit is located at grade level and provided with individual exterior entrance/egress, at least one receptacle outlet readily accessible from grade and not more than 2.0 m (6½ ft) above grade level shall be installed.

(3) Balconies, Decks, and Porches.

Balconies, decks, and porches that are within 102 mm (4 in.) horizontally of the dwelling unit shall have at least one receptacle outlet accessible from the balcony, deck, or porch. The receptacle outlet shall not be located more than 2.0 m (6½ ft) above the balcony, deck, or porch walking surface.

Additional Proposed Changes

File Name	Description	Approved
CN_123.pdf	70_CN123	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 123 appeared in the First Draft Report.

The Correlating Committee directs that the Panel reconsider whether this Informational Note is necessary. If this note is necessary the Panel should rewrite the Informational Note to comply with 3.1.3 of the NEC® Style Manual, explaining why the note is referring the user to this other section.

Related Item

• Correlating Note No. 123

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC

Organization: NEC Correlating Committee

Street Address:

City:

State:

Zip:

Submittal Date: Wed Aug 04 14:39:03 EDT 2021

Committee: NEC-P02

Correlating Committee Note No. 123-NFPA 70-2021 [Section No. 210.52(E)]

Submitter Information Verification

Committee: NEC-AAC

Submittal Date: Tue May 04 14:40:01 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs that the Panel reconsider whether this Informational Note is necessary. If this note is necessary the Panel should rewrite the Informational Note to comply with 3.1.3 of the NEC® Style Manual, explaining why the note is referring the user to this other section.

Ballot Results

✔ **This item has passed ballot**

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

Affirmative All

Ayer, Lawrence S.

Gallo, Ernest J.

Hickman, Palmer L.

Holub, Richard A.

Hunter, Dean C.

Johnston, Michael J.

Kendall, David H.

Kovacik, John R.

Manche, Alan

McDaniel, Roger D.

Porter, Christine T.

Williams, David A.

Public Comment No. 1933-NFPA 70-2021 [New Section after 210.52(I)]

210.52(J) USB Receptacle Requirements for Bedrooms, Kitchens and Family Rooms.

In addition to the receptacle requirements in 210.52, at least one USB receptacle outlet shall be required in each bedroom, kitchen and family room. The USB receptacle outlet shall be permitted to be a USB charger only receptacle, combination USB charger with duplex receptacle or combination USB charger with single receptacle. The location of the USB receptacle outlet(s) shall be determined by the installer, designer, or building owner.

Informational note: A USB charger receptacle is a Type A, Type C or a combination of Type A and Type C USB ports.

Statement of Problem and Substantiation for Public Comment

The use of generic or non-UL listed chargers have escalated the risk of burn and electrocution, according to the Annal of Emergency Medicine which is published by the American College of Emergency Physicians. The areas such as the bedroom and kitchen are rooms where these types of chargers are mostly utilized. The technologies of USB type A and type C would cover the types of charging technologies that are used for today's electronics. Type A and C are both commercially and readily available in multiple configurations including devices that have both Type A and C along with a duplex receptacle.

Here is the link to results of the study and information of the American College of Emergency Physicians: https://www.emergencyphysicians.org/press-releases/2019/7-24-2019-generic-mobile-phone-chargers-escalate-risk-of-burn-electrocution

Related Item

- PI-4485

Submitter Information Verification

Submitter Full Name: Kevin Arnold
Organization: Eaton's Bussmann Business
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 18 16:56:18 EDT 2021
Committee: NEC-P02

Public Comment No. 1836-NFPA 70-2021 [Section No. 210.62]

210.62 Show Windows.

At least one 125-volt, single-phase, 15- or 20-ampere-rated receptacle outlet shall be installed within 450 mm (18 in.) of the top of ~~a show window for each~~ each show window. For show windows that exceed 5.5 m (18 ft) in total width, additional receptacles shall be installed such that each additional 3.7 linear m (12 linear ft) ~~or major fraction thereof of show window width~~ segment.is equipped with a receptacle outlet. The distances shall be measured horizontally at ~~its~~ the point of maximum width.

Statement of Problem and Substantiation for Public Comment

This comment responds to the confusion expressed by the Correlating Committee as to exactly how the distance measurement is to be applied. The six-foot gimme in the current wording should only apply once. A 15-foot window could have one receptacle minimum, but a 19-ft window would need two, as would a 24-foot window. and as would a 30-ft window. A 31-ft window would need three receptacles, because the 6-ft gimme has already been used, etc.

Related Item

• FR-9143 • CC Note 124

Submitter Information Verification

Submitter Full Name: Frederic Hartwell
Organization: Hartwell Electrical Services, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 18 10:25:18 EDT 2021
Committee: NEC-P02

Public Comment No. 254-NFPA 70-2021 [Section No. 210.62]

210.62 Show Windows.

At least one 125-volt, single-phase, 15- or 20-ampere-rated receptacle outlet shall be installed within 450 mm (18 in.) of the top of a show window for each 3.7 linear m (12 linear ft) or major fraction thereof of show window width measured horizontally at its maximum width. Exception: Occupancies listed as Factory (F-1, F-2); High Hazard (H-1, H-2, H-3, H-4, H-5); Institutional (I-1, I-2, I-3, I-4); Residential (R-1, R-2, R-3, R-4); Storage (S-1, S-2); Utility (U).

Statement of Problem and Substantiation for Public Comment

Although the National Electrical Code (NFPA 70) (210-62) requires show windows to have receptacles installed, it does not list the occupancies which require them. So instead of changing the text of the code, it is best just to add the exception. My experience has seen plans examiners mandate only this code section for Mercantile (M). This change will clarify any confusion on where they should be installed. Show windows and/or display windows are common in many occupancies and the use of extension cords running above ceilings is common in these occupancies. Show window receptacles in occupancies, other than the exception, would help to eliminate this fire hazard.

Related Item

- FR

Submitter Information Verification

Submitter Full Name: Neal Dorenkott
Organization: City Of North Olmsted
Affiliation: IBEW Local 38; Ohio Board of Building Standards (ESI, BO, BI)
Street Address:
City:
State:
Zip:

Submittal Date: Fri Jul 16 08:26:27 EDT 2021
Committee: NEC-P02

Public Comment No. 629-NFPA 70-2021 [Section No. 210.62]

210.62 Show Windows.

At least one 125-volt, single-phase, 15- or 20-ampere-rated receptacle outlet shall be installed within 450 mm (18 in.) of the top of a show window for each 3.7 linear m (12 linear ft) or major fraction thereof of show window width measured horizontally at its maximum width.

Additional Proposed Changes

File Name	Description	Approved
2_CN_124.pdf	2 CN124	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 124 appeared in the First Draft Report on First Revision No. 9143.

The Correlating Committee directs that the Panel clarify the language "or major fraction thereof' as it is not clear whether this is "the major fraction of a foot" or the "major fraction of 12 feet" (or major fraction in terms of meters?).

Related Item

• First Revision No. 9143

Submitter Information Verification

Submitter Full Name:	CC on NEC-AAC
Organization:	NEC Correlating Committee
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Mon Aug 02 15:30:41 EDT 2021
Committee:	NEC-P02

Correlating Committee Note No. 124-NFPA 70-2021 [Section No. 210.62]

Submitter Information Verification

Committee: NEC-P02
Submittal Date: Tue May 04 14:45:26 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs that the Panel clarify the language "or major fraction thereof" as it is not clear whether this is "the major fraction of a foot" or the "major fraction of 12 feet" (or major fraction in terms of meters?).

First Revision No. 9143-NFPA 70-2021 [Section No. 210.62]

Ballot Results

This item has passed ballot

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

Affirmative All

Ayer, Lawrence S.
Gallo, Ernest J.
Hickman, Palmer L.
Holub, Richard A.
Hunter, Dean C.
Johnston, Michael J.
Kendall, David H.
Kovacik, John R.
Manche, Alan
McDaniel, Roger D.
Porter, Christine T.
Williams, David A.

Public Comment No. 662-NFPA 70-2021 [Section No. 210.63(B)]

(B) Other Electrical Equipment.

In other than one- and two-family dwellings, a receptacle outlet shall be located as specified in 210.63(B)(1) and (B)(2).

(1) Indoor Service Equipment.

The required receptacle outlet shall be located within the same room or area as the service equipment.

(2) Indoor Equipment Requiring Dedicated Equipment Spaces.

Where equipment, other than service equipment, requires dedicated equipment space as specified in 110.26(E), the required receptacle outlet shall be located within the same room or area as the electrical equipment and shall not be connected to the load side of the equipment's disconnecting means.

Additional Proposed Changes

File Name	Description	Approved
2_CN_125_Detail.pdf	2 CN125	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No.125 appeared in the First Draft Report on First Revision No. 9144.

The Correlating Committee directs the Panel to reconsider the wording and revise as needed for clarity and ease of applying the requirements in regard to deleting the term branch circuit.

Related Item

- First Revision No. 9144

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 03 08:42:22 EDT 2021
Committee: NEC-P02

Correlating Committee Note No. 125-NFPA 70-2021 [Detail]

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Tue May 04 14:47:10 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs the Panel to reconsider the wording and revise as needed for clarity and ease of applying the requirements in regard to deleting the term branch circuit.

First Revision No. 9144-NFPA 70-2021 [Detail]

Ballot Results

This item has passed ballot

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

Affirmative All

Ayer, Lawrence S.
Gallo, Ernest J.
Hickman, Palmer L.
Holub, Richard A.
Hunter, Dean C.
Johnston, Michael J.
Kendall, David H.
Kovacik, John R.
Manche, Alan
McDaniel, Roger D.
Porter, Christine T.
Williams, David A.

Public Comment No. 1306-NFPA 70-2021 [Section No. 210.63(B)(2)]

(2) Indoor Equipment Requiring Dedicated Equipment Spaces.

Where equipment, other than service equipment, requires dedicated equipment space as specified in 110.26(E), the required receptacle outlet shall be located within the same room or area as the electrical equipment ~~and shall not be connected to the load side of the equipment's disconnecting means~~ .

Statement of Problem and Substantiation for Public Comment

If we have abuilding supplied by a feeder circuit we now must have a feeder circuit and a branch circuit supplying the structure, which violates 225.30. This requirement ends up snowballing into a very expensive installation.

Related Item

- FR 9144

Submitter Information Verification

Submitter Full Name:	Ryan Jackson
Organization:	Ryan Jackson
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Aug 11 16:48:18 EDT 2021
Committee:	NEC-P02

Public Comment No. 191-NFPA 70-2021 [Section No. 210.63(B)(2)]

(2) Indoor Equipment Requiring Dedicated Equipment Spaces.

Where equipment, other than service equipment, requires dedicated equipment space as specified in 110.26(E), the required receptacle outlet shall be located within the same room or area as the electrical equipment ~~and shall not be connected to the load side of the equipment's disconnecting means.~~ .

Statement of Problem and Substantiation for Public Comment

Public Input 620 should have been accepted as it was written. The disconnect for a panelboard, motor control center, or switchboard could actually be the service disconnect for the building! If that were the case, it would be virtually impossible to comply with this requirement as presently written. Please reconsider this unnecessary wording.What if there is only 1 panelboard in the entire building? It is ridiculous to require a 2nd feeder and panelboard to be installed simply to supply power to a receptacle? But that is presently what would be required. And of course if 2 panelboards were installed, each one would need to provide a circuit for a receptacle, since neither receptacle can be on the load side of the disconnect for its respective panelboard! This is completely ridiculous!!!! Please stop this insanity. The receptacles for this equipment should be treated the same as the service equipment in 210.63(B)(1)

Related Item

- PI 260

Submitter Information Verification

Submitter Full Name:	Russ Leblanc
Organization:	Leblanc Consulting Services
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Sat Jul 10 16:51:25 EDT 2021
Committee:	NEC-P02

Public Comment No. 281-NFPA 70-2021 [Section No. 210.63(B)(2)]

(2) Indoor Equipment Requiring Dedicated Equipment Spaces.

Where equipment, other than service equipment, requires dedicated equipment space as specified in 110.26(E), the required receptacle outlet shall be located within the same room or area as the electrical equipment ~~and shall not be connected to the load side of the equipment's disconnecting means~~ .

Statement of Problem and Substantiation for Public Comment

Restricting where the required receptacle outlet is served from may have an unintentional affect of causing additional equipment to be installed in order to meet the requirement or for a very long circuit to be installed to elsewhere in the facility.

For example, if a very small facility can be served by a single panelboard, the restriction would require a second panelboard to be installed just to meet the requirements. Furthermore, these two panelboards would have to be served from two separate upstream disconnecting means, precluding the ability of feeding one panelboard from the another panelboard.

Or if a facility has two panelboards located hundreds of feet away from one another, the restriction would require very long branch circuits to be pulled from opposite locations.

Related Item

•

Submitter Information Verification

Submitter Full Name: Jason Rohe
Organization: Schnackel Engineers
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jul 19 16:42:12 EDT 2021
Committee: NEC-P02

Public Comment No. 630-NFPA 70-2021 [Section No. 210.65(B)]

(B) Receptacle Outlets Required.

The total number of receptacle outlets, including floor outlets and receptacle outlets in fixed furniture, shall not be less than as determined in (1) and (2).

(1) Receptacle Outlets in Fixed Walls.

The required number of receptacle outlets shall be determined in accordance with 210.52(A)(1) through (A)(4). These receptacle outlets shall be permitted to be located as determined by the installer, designer, or building owner.

(2) Floor Outlets.

A meeting room with any floor dimension that is 3.7 m (12 ft) or greater in any direction and that has a floor area of at least 20 m^2 (215 ft^2) shall have at least one floor receptacle outlet, or at least one floor outlet to serve a receptacle(s), located at a distance not less than 1.8 m (6 ft) from any fixed wall for each 20 m^2 (215 ft^2) or major portion of floor space.

Informational Note No. 1: See 314.27(B) for requirements on floor boxes used for receptacles located in the floor.

Informational Note No. 2: See 518.1 for requirements on assembly occupancies designed for 100 or more persons.

Additional Proposed Changes

File Name	Description	Approved
2_CN_126.pdf	2 CN126	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 126 appeared in the First Draft Report on First Revision No.9146.

The Correlating Committee directs that the Panel clarify the language "or major portion of floor space" in 210.65(6)(2) for clarity and ease of applying the requirements.

Related Item

• First Revision No.126

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:

Submittal Date: Mon Aug 02 15:41:23 EDT 2021
Committee: NEC-P02

Correlating Committee Note No. 126-NFPA 70-2021 [Section No. 210.65(B)(2)]

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Tue May 04 14:56:29 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs that the Panel clarify the language "or major portion of floor space" in 210.65(B)(2) for clarity and ease of applying the requirements.

First Revision No. 9146-NFPA 70-2021 [Section No. 210.65(B)(2)]

Ballot Results

✔ **This item has passed ballot**

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

Affirmative All

Ayer, Lawrence S.
Gallo, Ernest J.
Hickman, Palmer L.
Holub, Richard A.
Hunter, Dean C.
Johnston, Michael J.
Kendall, David H.
Kovacik, John R.
Manche, Alan
McDaniel, Roger D.
Porter, Christine T.
Williams, David A.

Public Comment No. 1534-NFPA 70-2021 [Section No. 210.70]

210.70 Lighting Outlets Required.

Lighting outlets shall be installed where specified in 210.70(A), (B), and (C). ~~The switch or wall-mounted control device shall not rely exclusively on a battery unless a means is provided for automatically energizing the lighting outlets upon battery failure.~~

(A) Dwelling Units.

In dwelling units, lighting outlets shall be installed in accordance with 210.70(A)(1) and (A)(2).

(1) Habitable Rooms.

At least one lighting outlet controlled by a listed wall-mounted control device shall be installed in every habitable room, kitchen, laundry area, and bathroom. The wall-mounted control device shall be located near an entrance to the room on a wall.

Exception No. 1: In other than kitchens, laundry areas, and bathrooms, one or more receptacles controlled by a listed wall-mounted control device shall be permitted in lieu of lighting outlets.

Exception No. 2: Lighting outlets shall be permitted to be controlled by occupancy sensors that are (1) in addition to listed wall-mounted control devices or (2) located at a customary wall switch location and equipped with a manual override that will allow the sensor to function as a wall switch.

(2) Additional Locations.

Additional lighting outlets shall be installed in accordance with the following:

(1) At least one lighting outlet controlled by a listed wall-mounted control device shall be installed in hallways, stairways, attached garages, detached garages, and accessory buildings with electric power.

(2) For dwelling units, attached garages, and detached garages with electric power, at least one exterior lighting outlet controlled by a listed wall-mounted control device shall be installed to provide illumination on the exterior side of outdoor entrances or exits with grade-level access. A vehicle door in a garage shall not be considered as an outdoor entrance or exit.

Exception to (2): For an outdoor, grade-level, sloped bulkhead door with stairway access to a sub-grade-level basement, the required lighting outlet that provides illumination on the stairway steps shall be permitted to be located in the basement interior within 1.5 m (5 ft) horizontally of the bottommost stairway riser. This interior lighting outlet shall be permitted to be controlled by a listed wall-mounted control device or by a unit switch of the interior luminaire or interior lampholder.

(3) Where lighting outlets are installed for an interior stairway with six or more risers between floor levels, there shall be a listed wall-mounted control device at each floor level and at each landing level that includes a stairway entry to control the lighting outlets.

Exception to (1), (2), and (3): Remote, central, or automatic control of lighting shall be permitted in hallways, in stairways, and at outdoor entrances.

(4) Dimmer control of lighting outlets installed in accordance with 210.70(A)(2)(3) shall not be permitted unless the listed control devices can provide dimming control to maximum brightness at each control location for the interior stairway illumination.

(B) Guest Rooms or Guest Suites.

In hotels, motels, or similar occupancies, guest rooms or guest suites shall have at least one lighting outlet controlled by a listed wall-mounted control device installed in every habitable room and bathroom.

Exception No. 1: In other than bathrooms and kitchens where provided, one or more receptacles controlled by a listed wall-mounted control device shall be permitted in lieu of lighting outlets.

Exception No. 2: Lighting outlets shall be permitted to be controlled by occupancy sensors that are (1) in addition to listed wall-mounted control devices or (2) located at a customary wall switch location and equipped with a manual override that allows the sensor to function as a wall switch.

(C) All Occupancies.

For attics and underfloor spaces, utility rooms, and basements, at least one lighting outlet containing a switch or controlled by a wall switch or listed wall-mounted control device shall be installed where these spaces are used for storage or contain equipment requiring servicing. A point of control shall be at each entry that permits access to the attic and underfloor space, utility room, or basement. Where a lighting outlet is installed for equipment requiring service, the lighting outlet shall be installed at or near the equipment.

Statement of Problem and Substantiation for Public Comment

The CMP should reject both PI 1489 and FR 9148 and preserve the 2020 language in 210.70.

Code Making Panel 2 overwhelming supported the 2020 code language. The substantiation provided with the public inputs that led to the current 2020 code language clearly described remote control devices communicating wirelessly to lighting controllers. It pointed out that they are being accepted as code compliant to serve as a “wall switch”. It appears that code panel members understood they could be battery powered. They acknowledged and accepted that these remote devices may not be electrically connected to the lighting branch circuit and may not provide a physical manual switching means. Voting 12-1 in favor, the committee statement indicated that the revised language “will permit lighting and receptacle control technology that is currently available and being installed in dwellings and commercial buildings today. Numerous manufacturers offer remote devices that wirelessly communicate with controllers that control the lighting outlet or receptacle.”

PI 1489 and FR 9148 provide no data to substantiate a safety issue associated with battery powered control devices controlling lighting outlets. Battery powered control devices provide a reliable means of switching comparable to or exceeding the reliability of the lamp. Lamps fail. Incandescent lamps will fail sooner than the batteries in the currently available battery powered control devices on the market. The batteries in at least one manufacturer's device will last longer than Energy Star rated LED lamps are required to last. The code requires control devices to be wall-mounted putting the batteries within easy reach for convenient replacement, unlike failed lamps which often require the use of ladders. Besides lamp failure, power failures are common occurrences. Not only due to lost utility power, but also due to tripped circuit breakers caused by overloaded receptacle circuits. These circuits are often shared with one or more lighting circuits. Since its introduction in the 1975 NEC, this code section has never intended to ensure the areas where it requires lighting outlets could be illuminated if a lamp failed or the power failed. This is demonstrated by the fact that this code section requires only one lighting outlet to be installed and does not require emergency illumination. Also, 2017 and previous versions of the code do not even require wall switch controls to be located in the habitable rooms where lighting outlets are required. The lighting outlets required by this section of code are not safety related and clearly not life safety related.

Life Safety Code does not require emergency egress lighting in the occupancies covered in 210.70. In NFPA 101, all one- and two-family dwellings, lodging, rooming houses, as well as many apartment buildings, hotels and dormitories, residential board and care facilities, and businesses are not required to have emergency egress lighting to assure safe egress.

Critical life safety applications permit battery-operated devices. NFPA 72, the National Fire Alarm and Signaling Code, permits batteries to serve as the sole source of power for a low-power radio (wireless) transmitter/transceiver. Residential (dwelling unit) smoke and carbon monoxide detectors are commonly powered solely by batteries. While these applications require notification of battery failure due to their critical life safety function, the lighting control devices required by 210.70 of the NEC are clearly not critical life safety in nature and should be permitted to be battery powered without condition.

Prohibiting battery operated control devices impedes the adoption of proven technology that provides cost savings, energy savings, convenience, and security. Wiring is greatly simplified. Sensors, dimming, geofencing, and scheduling reduce energy use. Users monitor and adjust lighting and other integrated systems conveniently from anywhere with their mobile device. Lighting is integrated with and activated by home security cameras and automatically activated upon arriving home. Battery operated control devices are important building blocks of this new technology and should be recognized for their contribution to innovative advancements in homes and buildings and not stifled by needless code restrictions.

Related Item

- • PI 1489 & FR 9148

Submitter Information Verification

Submitter Full Name: Megan Hayes
Organization: Nema
Street Address:
City:
State:
Zip:

Submittal Date: Mon Aug 16 12:03:50 EDT 2021
Committee: NEC-P02

Public Comment No. 631-NFPA 70-2021 [Section No. 210.70(A)]

(A) Dwelling Units.

In dwelling units, lighting outlets shall be installed in accordance with 210.70(A)(1) and (A)(2).

(1) Habitable Rooms.

At least one lighting outlet controlled by a listed wall-mounted control device shall be installed in every habitable room, kitchen, laundry area, and bathroom. The wall-mounted control device shall be located near an entrance to the room on a wall.

Exception No. 1: In other than kitchens, laundry areas, and bathrooms, one or more receptacles controlled by a listed wall-mounted control device shall be permitted in lieu of lighting outlets.

Exception No. 2: Lighting outlets shall be permitted to be controlled by occupancy sensors that are (1) in addition to listed wall-mounted control devices or (2) located at a customary wall switch location and equipped with a manual override that will allow the sensor to function as a wall switch.

(2) Additional Locations.

Additional lighting outlets shall be installed in accordance with the following:

(1) At least one lighting outlet controlled by a listed wall-mounted control device shall be installed in hallways, stairways, attached garages, detached garages, and accessory buildings with electric power.

(2) For dwelling units, attached garages, and detached garages with electric power, at least one exterior lighting outlet controlled by a listed wall-mounted control device shall be installed to provide illumination on the exterior side of outdoor entrances or exits with grade-level access. A vehicle door in a garage shall not be considered as an outdoor entrance or exit.

Exception to (2): For an outdoor, grade-level, sloped bulkhead door with stairway access to a sub-grade-level basement, the required lighting outlet that provides illumination on the stairway steps shall be permitted to be located in the basement interior within 1.5 m (5 ft) horizontally of the bottommost stairway riser. This interior lighting outlet shall be permitted to be controlled by a listed wall-mounted control device or by a unit switch of the interior luminaire or interior lampholder.

(3) Where lighting outlets are installed for an interior stairway with six or more risers between floor levels, there shall be a listed wall-mounted control device at each floor level and at each landing level that includes a stairway entry to control the lighting outlets.

Exception to (1), (2), and (3): Remote, central, or automatic control of lighting shall be permitted in hallways, in stairways, and at outdoor entrances.

(4) Dimmer control of lighting outlets installed in accordance with 210.70(A)(2)(3) shall not be permitted unless the listed control devices can provide dimming control to maximum brightness at each control location for the interior stairway illumination.

Additional Proposed Changes

File Name	Description	Approved
2_CN_127.pdf	2 CN127	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 127 appeared in the First Draft Report on First Revision No. 9152.

The Correlating Committee directs that the Panel correlate the terms "laundry area" and "habitable rooms" as not all laundry areas are habitable rooms.

Related Item

• First Revision No. 9152

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 02 15:46:18 EDT 2021
Committee: NEC-P02

Correlating Committee Note No. 127-NFPA 70-2021 [Section No. 210.70(A)(1)]

Submitter Information Verification

Committee: NEC-P02

Submittal Date: Tue May 04 14:59:34 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs that the Panel correlate the terms "laundry area" and "habitable rooms" as not all laundry areas are habitable rooms.

First Revision No. 9152-NFPA 70-2021 [Section No. 210.70(A)(1)]

Ballot Results

✔ **This item has passed ballot**

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

Affirmative All

Ayer, Lawrence S.
Gallo, Ernest J.
Hickman, Palmer L.
Holub, Richard A.
Hunter, Dean C.
Johnston, Michael J.
Kendall, David H.
Kovacik, John R.
Manche, Alan
McDaniel, Roger D.
Porter, Christine T.
Williams, David A.

Public Comment No. 379-NFPA 70-2021 [Section No. 210.70(A)(1)]

(1) Habitable Rooms.

At least one lighting outlet controlled by a listed wall-mounted control device shall be installed in every habitable room, kitchen, laundry area, and bathroom. The wall-mounted control device shall be located near ~~an~~ each entrance to the room on a wall.

Exception No. 1: In other than kitchens, laundry areas, and bathrooms, one or more receptacles controlled by a listed wall-mounted control device shall be permitted in lieu of lighting outlets.

Exception No. 2: Lighting outlets shall be permitted to be controlled by occupancy sensors that are (1) in addition to listed wall-mounted control devices or (2) located at a customary wall switch location and equipped with a manual override that will allow the sensor to function as a wall switch.

Statement of Problem and Substantiation for Public Comment

This new wording will allow occupants to enter a habitable room at any location and operate a lighting outlet, therefore preventing an occupant from entering in the dark potentially causing a safety issue. This language is similar to language at 210.70(C) as it has the same hazard level.

During the Public Input process, CMP 2 focused on the word entrance, however the change from the word "an" to "each" will provide the necessary change to provide safety to the occupant by providing an illuminated entry at "each" point of entry.

Related Item

- Public Input No. 2712

Submitter Information Verification

Submitter Full Name: Greg Chontow
Organization: Town of Dover
Street Address:
City:
State:
Zip:

Submittal Date: Mon Jul 26 14:23:20 EDT 2021
Committee: NEC-P02

Public Comment No. 538-NFPA 70-2021 [Section No. 210.70(A)(1)]

(1) Habitable Rooms.

At least one lighting outlet controlled by a listed wall-mounted control device shall be installed in every habitable room, ~~kitchen,~~ laundry area, and bathroom. The wall-mounted control device shall be located near an entrance to the room on a wall.

Exception No. 1: In other than kitchens, laundry areas, and bathrooms, one or more receptacles controlled by a listed wall-mounted control device shall be permitted in lieu of lighting outlets.

Exception No. 2: Lighting outlets shall be permitted to be controlled by occupancy sensors that are (1) in addition to listed wall-mounted control devices or (2) located at a customary wall switch location and equipped with a manual override that will allow the sensor to function as a wall switch.

Statement of Problem and Substantiation for Public Comment

The word KITCHEN is redundant as the term HABITABLE ROOM as defined in Article 100 includes a room for COOKING. Removing the redundancy adds clarity and makes the document more user friendly.

Related Item

• FR-9152

Submitter Information Verification

Submitter Full Name:	Michal Hofkin
Organization:	Comment is independent of employment
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Thu Jul 29 13:31:30 EDT 2021
Committee:	NEC-P02

Public Comment No. 535-NFPA 70-2021 [Section No. 210.70(A)(2)]

(2) Additional Locations.

Additional lighting outlets shall be installed in accordance with the following:

(1) At least one lighting outlet controlled by a listed wall-mounted control device shall be installed in hallways, stairways, attached garages, detached garages, and accessory buildings with electric power.

(2) For dwelling units, attached garages, and detached garages with electric power, at least one exterior lighting outlet controlled by a listed wall-mounted control device shall be installed to provide illumination on the exterior side of outdoor entrances or exits with grade-level access. A vehicle door in a garage shall not be considered as an outdoor entrance or exit.

Exception to (2): For an outdoor, grade-level, ~~sloped~~ bulkhead door with stairway access to a sub-grade-level basement, the required lighting outlet that provides illumination on the stairway steps shall be permitted to be located in the basement interior within 1.5 m (5 ft) horizontally of the bottommost stairway riser. This interior lighting outlet shall be permitted to be controlled by a listed wall-mounted control device or by a unit switch of the interior luminaire or interior lampholder.

(3) Where lighting outlets are installed for an interior stairway with six or more risers between floor levels, there shall be a listed wall-mounted control device at each floor level and at each landing level that includes a stairway entry to control the lighting outlets.

Exception to (1), (2), and (3): Remote, central, or automatic control of lighting shall be permitted in hallways, in stairways, and at outdoor entrances.

(4) Dimmer control of lighting outlets installed in accordance with 210.70(A)(2)(3) shall not be permitted unless the listed control devices can provide dimming control to maximum brightness at each control location for the interior stairway illumination.

Additional Proposed Changes

File Name	Description	Approved
sidewalk_hatch_01.jpg	non-sloped sidewalk hatch 1	
sidewalk_hatch_02.jpg	non-sloped sidewalk hatch 2	
sidewalk_hatch_03.jpg	non-sloped sidewalk hatch 3	

Statement of Problem and Substantiation for Public Comment

The word SLOPED should be removed. In metropolitan areas there are flat (not sloped) sidewalk hatches that provide access to subgrade basements at dwelling units that this rule would also apply to. See attached photos

Related Item

• FR9149 • Public Input 8

Submitter Information Verification

Submitter Full Name: Michal Hofkin
Organization: Comment is unrelated to employment
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jul 29 12:49:34 EDT 2021
Committee: NEC-P02

Public Comment No. 1235-NFPA 70-2021 [Section No. 210.70 [Excluding any Sub-Sections]]

Lighting outlets shall be installed where specified in 210.70(A), (B), and (C). ~~The switch or wall-mounted control device shall not rely exclusively on a battery unless a means is provided for automatically energizing the lighting outlets upon battery failure.~~

Statement of Problem and Substantiation for Public Comment

The CMP should reject both PI 1489 and FR 9148 and preserve the 2020 language in 210.70.

Code Making Panel 2 overwhelming supported the 2020 code language. The substantiation provided with the public inputs that led to the current 2020 code language clearly described remote control devices communicating wirelessly to lighting controllers. It pointed out that they are being accepted as code compliant to serve as a “wall switch”. It appears that code panel members understood they could be battery powered. They acknowledged and accepted that these remote devices may not be electrically connected to the lighting branch circuit and may not provide a physical manual switching means. Voting 12-1 in favor, the committee statement indicated that the revised language “will permit lighting and receptacle control technology that is currently available and being installed in dwellings and commercial buildings today. Numerous manufacturers offer remote devices that wirelessly communicate with controllers that control the lighting outlet or receptacle.”

PI 1489 and FR 9148 provide no data to substantiate a safety issue associated with battery powered control devices controlling lighting outlets. Battery powered control devices provide a reliable means of switching comparable to or exceeding the reliability of the lamp. Lamps fail. Incandescent lamps will fail sooner than the batteries in the currently available battery powered control devices on the market. The batteries in at least one manufacturer’s device will last longer than Energy Star rated LED lamps are required to last. The code requires control devices to be wall-mounted putting the batteries within easy reach for convenient replacement, unlike failed lamps which often require the use of ladders. Besides lamp failure, power failures are common occurrences. Not only due to lost utility power, but also due to tripped circuit breakers caused by overloaded receptacle circuits. These circuits are often shared with one or more lighting circuits. Since its introduction in the 1975 NEC, this code section has never intended to ensure the areas where it requires lighting outlets could be illuminated if a lamp failed or the power failed. This is demonstrated by the fact that this code section requires only one lighting outlet to be installed and does not require emergency illumination. Also, 2017 and previous versions of the code do not even require wall switch controls to be located in the habitable rooms where lighting outlets are required. The lighting outlets required by this section of code are not safety related and clearly not life safety related.

Life Safety Code does not require emergency egress lighting in the occupancies covered in 210.70. In NFPA 101, all one- and two-family dwellings, lodging, rooming houses, as well as many apartment buildings, hotels and dormitories, residential board and care facilities, and businesses are not required to have emergency egress lighting to assure safe egress.

Critical life safety applications permit battery-operated devices. NFPA 72, the National Fire Alarm and Signaling Code, permits batteries to serve as the sole source of power for a low-power radio (wireless) transmitter/transceiver. Residential (dwelling unit) smoke and carbon monoxide detectors are commonly powered solely by batteries. While these applications require notification of battery failure due to their critical life safety function, the lighting control devices required by 210.70 of the NEC are clearly not critical life safety in nature and should be permitted to be battery powered without condition.

Placing needless requirements on battery operated control devices impedes the adoption of proven technology that provides cost savings, energy savings, convenience, and security. Wiring is greatly simplified. Sensors, dimming, geofencing, and scheduling reduce energy use. Users monitor and adjust lighting and other integrated systems conveniently from anywhere with their mobile device. Lighting is integrated with and activated by home security cameras and automatically activated upon arriving home. Battery operated control devices are important building blocks of this new technology and should be recognized for their contribution to innovative advancements in homes and buildings and not stifled by needless code restrictions.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 1237-NFPA 70-2021 [Section No. 210.70 [Excluding any Sub-Sections]]	

	Related Item
• Public Input No. 1489-NFPA 70-2020 [Section No. 210.70]	• First Revision No. 9148-NFPA 70-2021 [Section No. 210.70 [Excluding any Sub-Sections]]

Submitter Information Verification

Submitter Full Name: Robert Spehalski
Organization: Lutron Electronics Co., Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 11 10:38:35 EDT 2021
Committee: NEC-P02

Public Comment No. 1237-NFPA 70-2021 [Section No. 210.70 [Excluding any Sub-Sections]]

Lighting outlets shall be installed where specified in 210.70(A), (B), and (C). The switch or wall-mounted control device installed in accordance with 210.70(A) and (C) shall not rely exclusively on a battery unless a means is provided for automatically energizing the lighting outlets upon battery failure.

Statement of Problem and Substantiation for Public Comment

Guest rooms and guest suites covered by 210.70 (B), are installations supervised by professional maintenance personnel. This ensures failed batteries in remote-control devices are replaced just like failed lamps are replaced. If Public Comment No. 1235 is not accepted, this public comment should be accepted to exempt guest rooms and guest suites from the requirement for battery operated remote-control devices to automatically energize the lighting outlets upon battery failure.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 1235-NFPA 70-2021 [Section No. 210.70 [Excluding any Sub-Sections]]	Public Comment No. 1237 should be accepted if Public Comment No. 1235 is not accepted.

Related Item

- First Revision No. 9148-NFPA 70-2021 [Section No. 210.70 [Excluding any Sub-Sections]]

Submitter Information Verification

Submitter Full Name: Robert Spehalski
Organization: Lutron Electronics Co., Inc.
Street Address:
City:
State:
Zip:

Submittal Date: Wed Aug 11 10:57:45 EDT 2021
Committee: NEC-P02

Public Comment No. 748-NFPA 70-2021 [Section No. 210.70 [Excluding any Sub-Sections]]

Lighting outlets shall be installed where specified in 210.70(A), (B), and (C). ~~The switch or wall-mounted control device shall not rely exclusively on a battery unless a means is provided for automatically energizing the lighting outlets upon battery failure.~~

Statement of Problem and Substantiation for Public Comment

The Connectivity Standards Alliance develops and promotes global standards for wireless device-to-device communication. This includes smart lighting and light bulbs which are becoming an important piece of automated lighting control systems in all market segments. Battery-operated remote-control devices have proven to be a safe and reliable method of control for these devices and systems. The current 2020 NEC code recognizes this and during the 2020 code cycle the code panel supported the new code language to acknowledge their use. This proposed 2023 NEC draft change is a step backward and threatens innovative advancements of new technologies in automated lighting control systems.
The added text in the first paragraph of article 210.70 should be deleted to revert requirements back to the 2020 NEC language.

Related Item

• Public Input PI 1489 • First Revision FR 9148

Submitter Information Verification

Submitter Full Name: Tobin Richardson
Organization: Connectivity Standards Alliance
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 03 17:41:58 EDT 2021
Committee: NEC-P02

Public Comment No. 854-NFPA 70-2021 [Section No. 220.1]

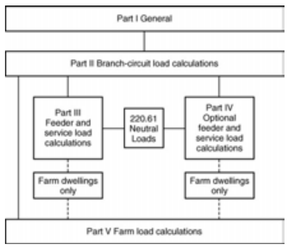
220.1 Scope.

This article provides requirements for calculating branch-circuit, feeder, and service loads. Part I provides general requirements for calculation methods. Part II provides calculation methods for branch-circuit loads. Parts III and IV provide calculation methods for feeder and service loads. Part V provides calculation methods for farm loads.

Informational Note No. 1: See examples in Informative Annex D.

Informational Note No. 2: See Figure Informational Note 220.1 for information on the organization of Article 220.

Figure Informational Note 220.1 Branch-Circuit, Feeder, and Service Load Calculation Methods.



Additional Proposed Changes

File Name	Description	Approved
CN_128.pdf	70_CN128	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 128 appeared in the First Draft Report.

The Correlating Committee directs the Panel to rewrite Informational Notes No. 1 and 2 to comply with the NEC Style Manual 4.1.3 and 4.1.4.

Related Item

• Correlating Note No. 128

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 04 14:43:13 EDT 2021
Committee: NEC-P02

Correlating Committee Note No. 128-NFPA 70-2021 [Section No. 220.1]

Submitter Information Verification

Committee: NEC-AAC

Submittal Date: Tue May 04 15:14:54 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs the Panel to rewrite Informational Notes No. 1 and 2 to comply with the NEC Style Manual 4.1.3 and 4.1.4.

Ballot Results

✔ **This item has passed ballot**

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

Affirmative All

Ayer, Lawrence S.

Gallo, Ernest J.

Hickman, Palmer L.

Holub, Richard A.

Hunter, Dean C.

Johnston, Michael J.

Kendall, David H.

Kovacik, John R.

Manche, Alan

McDaniel, Roger D.

Porter, Christine T.

Williams, David A.

Public Comment No. 288-NFPA 70-2021 [Section No. 220.3]

220.3 Other Articles for Specific-Purpose Calculations.

Table 220.3 shall provide references for specific-purpose calculation requirements not located in Chapters 5, 6, or 7 that amend or supplement the requirements of this article.

Table 220.3 Specific-Purpose Calculation References

Calculation	Article	Section (or Part)
Air-conditioning and refrigerating equipment, branch-circuit conductor sizing	440	Part IV
Capacitors	460	460.8
Fixed electric heating equipment for pipelines and vessels, branch-circuit sizing	427	427.4
Fixed electric space-heating equipment, branch-circuit sizing	424	424.3
Fixed outdoor electric deicing and snow-melting equipment, branch-circuit sizing	426	426.4
Fixed resistance and electrode industrial process heating equipment	425	425.4
Motors, feeder demand factor	430	430.26
Motors, multimotor and combination-load equipment	430	430.25
Motors, several motors or a motor(s) and other load(s)	430	430.24
Over ~~600~~ 1000 -volt ac and 1500-volt dc branch-circuit calculations	~~210~~ 235	~~210~~ 235 .19~~(B)~~
Over ~~600~~ 1000 -volt feeder calculations	215	215.2(B)
Phase converters, conductors	455	455.6
Storage-type water heaters	422	422.11

Statement of Problem and Substantiation for Public Comment

This public comment is submitted on behalf of a correlating committee CMP 2 task group formulated to create a new Article 235 to cover requirements for branch circuits over 1000 Vac and 15000 Vdc. This task group consists of the following members: Thomas Domitrovich, Paul Barnhart, David Williams, Alan Manche, Mike Querry, Kevin Rogers, Roger McDaniel, Rod Belisle.

This public comment aligns Table 220.3 with the new article 235 which includes all of the requirements for branch circuits 1000 Vac or 1500 Vdc.

This public comment also modifies the voltage level reference for feeders moving 600V to 1000V to align with the changes made in Article 215 which did the same. This correlates this section with Article 215. Modification of the voltage levels for Article 215 to add 1500 v dc were not made as that action is out of the scope of this task group.

It should be recognized that an inconsistency exists in regard to applications between 1000V and 1500V dc in reference to feeder requirements of Article 215.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 285-NFPA 70-2021 [New Article after 230]	New article references

Related Item

- PI 3819

Submitter Information Verification

Submitter Full Name: Thomas Domitrovich
Organization: Eaton Corporation
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jul 19 19:24:18 EDT 2021
Committee: NEC-P02

Public Comment No. 1428-NFPA 70-2021 [Section No. 220.5(A)]

(A) Voltages.

Unless other voltages are specified, for purposes of calculating branch-circuit and feeder loads, nominal system voltages of 120, 120/240, 208Y/120, 240, 347, 480Y/277, 480, 600Y/347, ~~and 600 volts~~ 1000 volts ac, and 1500 volts dc shall be used.

Statement of Problem and Substantiation for Public Comment

This public comment is submitted on behalf of a correlating committee CMP 2 task group formulated to create a new Article 235 to cover requirements for branch circuits over 1000 Vac and 15000 Vdc. This task group consists of the following members: Thomas Domitrovich, Paul Barnhart, David Williams, Alan Manche, Mike Querry, Kevin Rogers, Roger McDaniel, Rod Belisle. This comment adds both 1000 Vac and 1500 Vdc to ensure alignment with the actions of the medium voltage task group.

Related Item

• FR 9188 •

Submitter Information Verification

Submitter Full Name:	Thomas Domitrovich
Organization:	Eaton Corporation
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Fri Aug 13 10:32:36 EDT 2021
Committee:	NEC-P02

Public Comment No. 1307-NFPA 70-2021 [Section No. 220.5(C)]

(C) Floor Area.

The floor area for each floor shall be calculated from the outside dimensions of the building, dwelling unit, or other area involved. For dwelling units, the calculated floor area shall not include open porches or unfinished areas not adaptable for future use .

Statement of Problem and Substantiation for Public Comment

I have no problem including the garage in the calculation, but why would we include an area that is not adaptable for future use? Now I need to calculate crawl spaces and mechanical chases at 3 VA? That was not substantiated.

Related Item

- FR 9153

Submitter Information Verification

Submitter Full Name:	Ryan Jackson
Organization:	Ryan Jackson
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Aug 11 17:03:39 EDT 2021
Committee:	NEC-P02

Public Comment No. 856-NFPA 70-2021 [Section No. 220.10(A)]

(A) Load Calculation.

Branch-circuit loads shall be calculated as shown in 220.14, 220.17, 220.18, 220.19, and 220.20.

Additional Proposed Changes

File Name	Description	Approved
CN_129.pdf	70_CN129	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 129 appeared in the First Draft Report on First Revision No. 9161 and First Revision No. 9164.

The Correlating Committee directs that the Panel rewrite the language in 220.1 O(A) and correlate with action taken on FR9161, FR 9164 and other first revisions. The sections 220.17, 18, 19, and 20 don't exist in the First Draft.

Related Item

• First Revision No. 9161 • First Revision No. 9164

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:

Submittal Date: Wed Aug 04 14:45:16 EDT 2021
Committee: NEC-P02

Correlating Committee Note No. 129-NFPA 70-2021 [Section No. 220.10(A)]

Submitter Information Verification

Committee: NEC-AAC

Submittal Date: Tue May 04 15:22:25 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs that the Panel rewrite the language in 220.10(A) and correlate with action taken on FR9161, FR 9164 and other first revisions. The sections 220.17, 18, 19, and 20 don't exist in the First Draft.

Ballot Results

✔ **This item has passed ballot**

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

Affirmative All

Ayer, Lawrence S.
Gallo, Ernest J.
Hickman, Palmer L.
Holub, Richard A.
Hunter, Dean C.
Johnston, Michael J.
Kendall, David H.
Kovacik, John R.
Manche, Alan
McDaniel, Roger D.
Porter, Christine T.
Williams, David A.

Public Comment No. 882-NFPA 70-2021 [Section No. 220.10(B)]

(B) Maximum Load.

The total load on a branch circuit shall not exceed the rating of the branch circuit and it shall not exceed the maximum loads specified in 220.10(B)(1) through (B)(3) under the conditions specified therein.

(1) Motor-Operated and Combination Loads.

Where a circuit supplies only motor-operated loads, the conductor sizing requirement specified in 430.22 shall apply. Where a circuit supplies only air-conditioning equipment, refrigerating equipment, or both, the requirements of 440.6 shall apply. For circuits supplying loads consisting of motor-operated utilization equipment that is fastened in place and has a motor larger than ⅛ hp in combination with other loads, the total calculated load shall be based on 125 percent of the largest motor load plus the sum of the other loads in accordance with 430.24.

(2) Inductive and LED Lighting Loads.

For circuits supplying lighting units that have ballasts, transformers, autotransformers, or LED drivers, the calculated load shall be based on the total ampere ratings of such units and not on the total watts of the lamps.

(3) Electric Cooking Appliances.

Applying demand factors for ranges, wall-mounted ovens, counter-mounted cooking units, and other household cooking appliance loads in excess of 1¾ kW shall be permitted in accordance with Table 220.55, including Notes 4, 5, and 6.

Additional Proposed Changes

File Name	Description	Approved
CN_130.pdf	70_CN130	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 130 appeared in the First Draft Report on First Revision No. 9164 and First Revision No. 9161.

The Correlating Committee directs that the Panel review the repetition between 220.10(6)(1) and (8)(2) and 220.14(C) and (D), specific to motors and luminaires, to correlate these sections and eliminate any redundancy and conflicting language.

Related Item

• First Revision No. 9164 • First Revision No. 9161

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 04 15:35:13 EDT 2021
Committee: NEC-P02

Correlating Committee Note No. 130-NFPA 70-2021 [Section No. 220.10(B)]

Submitter Information Verification

Committee: NEC-AAC

Submittal Date: Tue May 04 15:27:34 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs that the Panel review the repetition between 220.10(B)(1) and (B)(2) and 220.14(C) and (D), specific to motors and luminaires, to correlate these sections and eliminate any redundancy and conflicting language.

FR-9164-NFPA 70-2021

FR-9161-NFPA 70-2021

Ballot Results

This item has passed ballot

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

Affirmative All

Ayer, Lawrence S.

Gallo, Ernest J.

Hickman, Palmer L.

Holub, Richard A.

Hunter, Dean C.

Johnston, Michael J.

Kendall, David H.

Kovacik, John R.

Manche, Alan

McDaniel, Roger D.

Porter, Christine T.

Williams, David A.

Public Comment No. 887-NFPA 70-2021 [Section No. 220.14(I)]

(I) Receptacle Outlets.

Except as covered in 220.41 and (K), receptacle outlets shall be calculated at not less than 180 volt-amperes for each single or for each multiple receptacle on one yoke. A single piece of equipment consisting of a multiple receptacle comprised of four or more receptacles shall be calculated at not less than 90 volt-amperes per receptacle. This provision shall not be applicable to the receptacle outlets specified in 210.11(C)(1) and (C)(2).

Additional Proposed Changes

File Name	Description	Approved
CN_131.pdf	70_CN131	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 131 appeared in the First Draft Report on First Revision No. 9157.

The Correlating Committee directs that the Panel reconsider the language in 220.14(1) as the reference to "(K)" is incomplete. FR-9157 should be reviewed and reconsidered to verify what sections are being covered in 220.14(J).

Related Item

- First Revision No. 9157

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 04 15:39:05 EDT 2021
Committee: NEC-P02

Correlating Committee Note No. 131-NFPA 70-2021 [Section No. 220.14(I)]

Submitter Information Verification

Committee: NEC-AAC
Submittal Date: Tue May 04 15:30:46 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs that the Panel reconsider the language in 220.14(I) as the reference to "(K)" is incomplete. FR-9157 should be reviewed and reconsidered to verify what sections are being covered in 220.14(J).

Ballot Results

✔ **This item has passed ballot**

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

Affirmative All

Ayer, Lawrence S.
Gallo, Ernest J.
Hickman, Palmer L.
Holub, Richard A.
Hunter, Dean C.
Johnston, Michael J.
Kendall, David H.
Kovacik, John R.
Manche, Alan
McDaniel, Roger D.
Porter, Christine T.
Williams, David A.

Public Comment No. 890-NFPA 70-2021 [Section No. 220.40]

220.40 General.

The calculated load of a feeder or service shall not be less than the sum of the loads on the branch circuits supplied, as determined by Part II of this article, after any applicable demand factors permitted by Part III or IV or required by Part V have been applied.

Informational Note: See Examples D1(a) through D10 in Informative Annex D. See 220.18(B) for the maximum load in amperes permitted for lighting units operating at less than 100 percent power factor.

Additional Proposed Changes

File Name	Description	Approved
CN_132.pdf	70_CN132	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 132 appeared in the First Draft Report.

The Correlating Committee directs that the Panel rewrite the informational note to 220.40 in compliance with NEC Style Manual 4.1.3. The Panel should review the second sentence to determine if it is necessary since 220.1 B(B) has been deleted.

Related Item

• Correlating Note No. 132

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 04 15:40:35 EDT 2021
Committee: NEC-P02

Correlating Committee Note No. 132-NFPA 70-2021 [Section No. 220.40]

Submitter Information Verification

Committee: NEC-AAC

Submittal Date: Tue May 04 15:37:19 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs that the Panel rewrite the informational note to 220.40 in compliance with NEC Style Manual 4.1.3. The Panel should review the second sentence to determine if it is necessary since 220.18(B) has been deleted.

Ballot Results

✔ **This item has passed ballot**

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

Affirmative All

Ayer, Lawrence S.
Gallo, Ernest J.
Hickman, Palmer L.
Holub, Richard A.
Hunter, Dean C.
Johnston, Michael J.
Kendall, David H.
Kovacik, John R.
Manche, Alan
McDaniel, Roger D.
Porter, Christine T.
Williams, David A.

Public Comment No. 1341-NFPA 70-2021 [Section No. 220.42(A)]

(A) General.

A unit load of not less than that specified in Table 220.42(A) for non-dwelling occupancies and the floor area determined in 220.5(C) shall be used to calculate the minimum lighting load. Motors rated less than ⅛ HP and connected to a lighting circuit shall be considered general lighting load.

Informational Note: The unit values of Table 220.42(A) are based on minimum load conditions and 80 percent power factor and might not provide sufficient capacity for the installation contemplated.

Table 220.42(A) General Lighting Loads by Non-Dwelling Occupancy

Type of Occupancy	Unit Load	
	Volt-amperes/ m^2	Volt-amperes/ ft^2
Automotive facility	16	1.5
Convention center	15	1.4
Courthouse	15	1.4
Dormitory	16	1.5
Exercise center	15	1.4
Fire station	14	1.3
Gymnasium[1]	18	1.7
Health care clinic	17	1.6
Hospital	17	1.6
Hotel or motel, or apartment house without provisions for cooking by tenants[2]	18	1.7
Library	16	1.5
Manufacturing facility[3]	24	2.2
Motion picture theater	17	1.6
Museum	17	1.6
Office[4]	14	1.3
Parking garage[5]	3	0.3
Penitentiary	13	1.2
Performing arts theater	16	1.5
Police station	14	1.3
Post office	17	1.6
Religious facility	24	2.2
Restaurant[6]	16	1.5
Retail[7, 8]	20	1.9
School/university	16	1.5
Sports arena	16	1.5
Town hall	15	1.4
Transportation	13	1.2
Warehouse	13	1.2
Workshop	18	1.7

Note: The 125 percent multiplier for a continuous load as specified in 210.20(A) is included, therefore no additional multiplier shall be required when using the unit loads in this table for calculating the minimum lighting load for a specified occupancy. For calculations that do not require allowances for continuous loading, the values in table can be adjusted by applying a factor of 0.8.

[1]Armories and auditoriums are considered gymnasium-type occupancies.

[2]Lodge rooms are similar to hotels and motels.

[3]Industrial commercial loft buildings are considered manufacturing-type occupancies.

[4]Banks are office-type occupancies.

[5]Commercial (storage) garages are considered parking garage occupancies.

[6]Clubs are considered restaurant occupancies.

[7]Barber shops and beauty parlors are considered retail occupancies.

[8]Stores are considered retail occupancies.

Statement of Problem and Substantiation for Public Comment

There are numerous instances where the relevant load number is one that does not make allowances for continuous loading. A classic example is 215.2(A)(1) Exception No. 2, where the wire sizing is permitted to ignore the normal allowances for connected equipment designed at both ends of a circuit. The only limiting factor her is wire ampacity, which by definition includes continuous loads without further modification. Now that this table is expressly spelling out that it is based on 125% for continuous, it is critical to complete the picture. As written, the table is designed for the end of a wire at equipment terminations covered in 110.14(C); when the calculations are performed based on the middle of the wire only, then the table numbers must be adjusted. Other examples of this include all applications of circuit protective devices that are listed for operation at 100% of the rating.

Related Item

• FR-9154

Submitter Information Verification

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Zip:

Submittal Date: Thu Aug 12 07:51:13 EDT 2021

Committee: NEC-P02

Public Comment No. 430-NFPA 70-2021 [Section No. 220.42(B)]

(B) Energy Code.

Where the building is designed and constructed to comply with an energy code adopted by the local authority, the lighting load shall be permitted to be calculated using the unit values specified in the energy code where the following conditions are met:

(1) A power monitoring system is installed that will provide continuous information regarding the total general lighting load of the building.

(2) The power monitoring system will be set with alarm values to alert the building owner or manager if the lighting load exceeds the values set by the energy code. Automatic means to take action to reduce the connected load shall be permitted.

(3) The demand factors specified in 220.45 are not applied to the general lighting load.

(4) The continuous load multiplier of 125 percent shall be applied <u>except to the EVSE load when the minimum 7200 VA is used</u> .

Statement of Problem and Substantiation for Public Comment

EEI agrees to 7200 VA as a minimum; however, when combining the comments from FR-9182-NFPA 70-2021 that EVSE's should be considered Continuous Loads, the 7200 VA actually results in a 9000 VA minimum.

The actual maximum load on a 30 amp circuit is 24 amps continuous. So, the load should be calculated at 5760 VA and not 7200 VA. If calculated at 7200 plus 1.25 as a continuous load equates to the service and feed load calculation at 9000 VA.

Related Item

• FR-9170-NFPA 70-2021

Submitter Information Verification

Submitter Full Name: Christopher Pavese
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Submittal Date: Tue Jul 27 14:38:02 EDT 2021
Committee: NEC-P02

Public Comment No. 893-NFPA 70-2021 [Section No. 220.43]

220.43 Office Buildings.

In office buildings, the receptacle loads shall be calculated to be the larger of the following:

(1) The calculated load from 220.14(I) after Table 220.47 demand factors have been applied

(2) 11 volt-amperes/m^2 or 1 volt-ampere/ft^2

Additional Proposed Changes

File Name	Description	Approved
CN_133.pdf	70_CN133	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 133 appeared in the First Draft Report on First Revision No. 9157.

The Correlating Committee directs that the Panel reconsider the reference to 220.14(1) as it appears to be incorrect as a result of the Article 220 rewrite.

Related Item

• First Revision No. 9157

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
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Submittal Date: Wed Aug 04 15:42:08 EDT 2021
Committee: NEC-P02

Correlating Committee Note No. 133-NFPA 70-2021 [Section No. 220.43]

Submitter Information Verification

Committee: NEC-AAC

Submittal Date: Tue May 04 15:48:18 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs that the Panel reconsider the reference to 220.14(I) as it appears to be incorrect as a result of the Article 220 rewrite.

FR-9157-NFPA 70-2021

Ballot Results

✔ **This item has passed ballot**

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

Affirmative All

Ayer, Lawrence S.
Gallo, Ernest J.
Hickman, Palmer L.
Holub, Richard A.
Hunter, Dean C.
Johnston, Michael J.
Kendall, David H.
Kovacik, John R.
Manche, Alan
McDaniel, Roger D.
Porter, Christine T.
Williams, David A.

Public Comment No. 632-NFPA 70-2021 [New Section after 220.44]

The Correlating Committee notes that ballot statements on FR 8222 mention the need for establishing purview of load calculations for health care facilities. Under their responsibilities to assign purview, the Correlating Committee (as seen in SCR-39 in the 2020 NEC cycle) established that CMP-2 has purview over general load calculations that are occupancy based throughout the NEC. CMP-2 has responsibilities for load calculations/demand factors and this is reflected in their actions on FR 9189.

For Correlation and to avoid conflicts, the Correlating Committee has established a Task Group with representation from CMP-15 and CMP-2 to work on establishing load calculation demand factors specific to cord- and plug-connected loads as well as demand factors for general purpose receptacles in the healthcare industry (as indicated in the concerns raised by CMP-2 in the statement to FR 9189). The established demand factors should be located in Article 220 as general requirements.

Additional Proposed Changes

File Name	Description	Approved
2_CN_180.pdf	2 CN180	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 180 appeared in the First Draft Report on First Revision No. 9189.

The Correlating Committee notes that ballot statements on FR 8222 mention the need for establishing purview of load calculations for health care facilities. Under their responsibilities to assign purview, the Correlating Committee (as seen in SCR-39 in the 2020 NEC cycle) established that CMP-2 has purview over general load calculations that are occupancy based throughout the NEC. CMP-2 has responsibilities for load calculations/demand factors and this is reflected in their actions on FR 9189.

For Correlation and to avoid conflicts, the Correlating Committee has established a Task Group with representation from CMP-15 and CMP-2 to work on establishing load calculation demand factors specific to cord- and plug-connected loads as well as demand factors for general purpose receptacles in the healthcare industry (as indicated in the concerns raised by CMP-2 in the statement to FR 9189). The established demand factors should be located in Article 220 as general requirements.

Related Item

• First Revision No. 9189

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
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Submittal Date: Mon Aug 02 15:49:05 EDT 2021
Committee: NEC-P02

Correlating Committee Note No. 180-NFPA 70-2021 [New Section after 220.44]

Submitter Information Verification

Committee: NEC-P02
Submittal Date: Wed May 05 12:17:37 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee notes that ballot statements on FR 8222 mention the need for establishing purview of load calculations for health care facilities. Under their responsibilities to assign purview, the Correlating Committee (as seen in SCR-39 in the 2020 NEC cycle) established that CMP-2 has purview over general load calculations that are occupancy based throughout the NEC. CMP-2 has responsibilities for load calculations/demand factors and this is reflected in their actions on FR 9189.

For Correlation and to avoid conflicts, the Correlating Committee has established a Task Group with representation from CMP-15 and CMP-2 to work on establishing load calculation demand factors specific to cord- and plug-connected loads as well as demand factors for general purpose receptacles in the healthcare industry (as indicated in the concerns raised by CMP-2 in the statement to FR 9189). The established demand factors should be located in Article 220 as general requirements.

First Revision No. 9189-NFPA 70-2021 [New Section after 220.44]

Ballot Results

✔ **This item has passed ballot**

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

Affirmative All

Ayer, Lawrence S.
Gallo, Ernest J.
Hickman, Palmer L.
Holub, Richard A.
Hunter, Dean C.
Johnston, Michael J.
Kendall, David H.
Kovacik, John R.
Manche, Alan
McDaniel, Roger D.
Porter, Christine T.
Williams, David A.

Public Comment No. 1745-NFPA 70-2021 [Section No. 220.48]

220.48 Receptacle Loads — Health Care.

Receptacle loads calculated in accordance with 220.14(H) and (I) shall be permitted to be subjected to the demand factors provided in Table 220.48 for health care facilities covered in Article 517. Demand factors for general-use receptacles and individual branch circuits not exceeding 150 volts to ground shall be permitted to be applied in accordance with 220.48(A), and (B).

~~Table 220.48 Demand Factors for Health Care Receptacle Loads~~

Informational Note: See Article 100 for the definitions of patient care space categories.

(A) General-Use Receptacles in Category 1 and Category 2 Patient Care Spaces.

The demand factor for general-use receptacles in Category 1 and Category 2 patient cares spaces shall be permitted to be calculated in accordance with Table 220.48(A).

Table 220.48(A) Demand Factors for General-Use Receptacles in Category 1 and Category 2 Patient Care Spaces.

Portion of Receptacle Load to Which Demand Factor Applies (Volt-Amperes)	Demand Factor (%)
First ~~7500~~ 5,000 or less	~~125~~ 100
~~From 7501~~ Next 5,000 to 10,000	~~100~~ 50
~~From 10,001 to 15,000 50 Remainder over 15,000 45~~	
Remainder over 10,000	25

Informational Note: See 220.14(I) for the calculation of general-use receptacle loads

(B) General-Use Receptacles in Category 3 and Category 4 patient care spaces.

The demand factor for general-use receptacles in Category 3 and Category 4 patient care spaces shall be permitted to be calculated in accordance with Table 220.48(B).

Table 220.48(B) Demand Factors for General Use Receptacles in Category 3 and Category 4 Patient Care Spaces

Portion of Receptacle Load to Which Demand Factor Applies (Volt-Amperes)	Demand Factor (%)
First 10,000 or less	100
Remainder over 10,000 kVA at	50

Statement of Problem and Substantiation for Public Comment

This public comment modifies the contents of 220.48 with the data and of the Healthcare task group. This modification focuses the demand factors for only those areas within a healthcare installation for category 1 and 2 patient care spaces. This is a decent compromise to address the increased amount of receptacle outlets in these specific areas and does not provide an avenue for demand factors that would impact a much broader aspect of these installations. Having the requirements for load calculations as part of Article 220 helps ensure a one stop shop for load calculations and helps pave the road for driving consistency and usability of the NEC.

Related Item

- FR 9189

Submitter Information Verification

Submitter Full Name:	Thomas Domitrovich
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City:	
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Submittal Date:	Tue Aug 17 16:02:25 EDT 2021
Committee:	NEC-P02

Public Comment No. 1821-NFPA 70-2021 [Section No. 220.48]

220.

~~48 Receptacle Loads —~~
48 Demand Factors for Health Care .

(1) **General Use Receptacle loads**

~~calculated in accordance with 220.14(H) and (I)~~

(1) **for patient care spaces** . General use receptacle loads for patient care spaces in health care shall be permitted to be

~~subjected~~

(1) made subject to the demand factors

~~provided in Table 220.48 for health care facilities covered in Article~~

(1) given in 517.

~~**Table 220.48 Demand Factors for Health Care Receptacle Loads**~~
~~Portion of Receptacle Load to Which Demand Factor Applies (Volt-Amperes) Demand Factor (%) First 7500 or less 125 From 7501 to 10,000 100 From 10,001 to 15,000 50 Remainder over 15,000 45~~

(1) ~~22.~~

(2) ~~**Diagnostic Imaging and Treatment Equipment**~~ ~~Diagnostic imaging and treatment equipment installations shall be permitted to be made subject to the demand factors given in 517.73~~

Additional Proposed Changes

File Name	Description	Approved
NEC_Healthcare_Demand_Factor_TG_-_Final_Document_Panel_2_Submittal.docx	Proposed revisions and substantiation	

Statement of Problem and Substantiation for Public Comment

This Public Comment is being submitted on behalf of the CMP2/CMP15 Demand Factor Task Group. The Task Group members consisted of Rich Holub, Robert Osborne, David Johnson, Mark Daniel Cook, Tom Domitrovich, John McCamish, Mark Hilbert, Todd Lottmann, Chad Kennedy, Chad Beebe, Walt Vernon, Dave Dagenais, Krista Biason and Jason Dantona. This Public Comment seeks to replace the First Draft Table 220.48 with two first level subdivisions to clarify there are optional demand factors in Article 517. A correlating Public Comment has been submitted to CMP15 to add new optional demand factors for general use receptacle loads in Category 1 and Category 2 patient care spaces in 517.22.

The CMP2/CMP15 task group was formed to resolve a correlation issue that resulted from actions taken during the first draft of the 2023 NEC. The task group was charged with proposing language that would resolve the correlation issue with feedback from CMP2, CMP15, and other key contributors. The recommended revision would place a permissive rule in Article 220 to point users to an optional method in Article 517 for patient care spaces in proposed 220.48(A). A new 220.48(B) is also proposed to point the user to the demand factors for diagnostic imaging and treatment equipment and to increase usability of the code.
Table 517.22(A) from the first draft was revised to be limited to Category 1 and Category 2 patient care spaces where the main issue of a large number of general use receptacles exists. Based on the large number of receptacles required in Category 1 and Category 2 patient care spaces and the data established as part of an NFPA Research Foundation project, this public comment offers a reasonable set of demand factors that can be applied when calculating the feeder and service loads for receptacle outlets in these patient care spaces. By making the use of this table a permissive application, as opposed to a mandatory requirement, the requirements of Article 220 can be applied if desired. A new Informational Note was added to direct users to 220.14(I) for the calculation of general-use receptacle loads.
Table 517.22(B) from the first draft was removed as there was insufficient substantiation to justify applying demand factors to cord- and plug-connected loads served by individual branch circuits. A new Table 517.22(B), which essentially replicates the requirements from Article 220, is proposed to clarify how to apply demand factors for Category 3 and Category 4 patient care spaces.

The CMP2/CMP15 task group proposes this structure and the associated demand factors to represent a balanced view from both code making panels. The correlating committee placed purview under CMP2 for the demand factors and this task group is recommending this structure including; the permissive language in 220.48, locating the demand factor tables for general purpose receptacles in Category 1 and 2 and Category 3 and 4 patient care spaces in Article 517 and the removal of demand factor table for equipment fed by individual branch circuits. If any of these conditions change the task group requests the correlating committee reassess the purview.

Related Public Comments for This Document

Related Comment	Relationship

Public Comment No. 1822-NFPA 70-2021 [Section No. 517.22]

Public Comment No. 1822-NFPA 70-2021 [Section No. 517.22]

Related Item

- FR 9189

Submitter Information Verification

Submitter Full Name:	Mark Hilbert
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Submittal Date:	Wed Aug 18 07:33:37 EDT 2021
Committee:	NEC-P02

Section No. 220.48 (new)

220.48 Demand Factors for Health Care.

(A) **General Use Receptacle loads for patient care spaces**. General use receptacle loads for patient care spaces in health care shall be permitted to be made subject to the demand factors given in 517.22.
(B) **Diagnostic Imaging and Treatment Equipment**. Diagnostic imaging and treatment equipment installations shall be permitted to be made subject to the demand factors given in 517.73

Substantiation:

This Public Comment is being submitted on behalf of the CMP2/CMP15 Demand Factor Task Group. The Task Group members consisted of Rich Holub, Robert Osborne, David Johnson, Mark Daniel Cook, Tom Domitrovich, John McCamish, Mark Hilbert, Todd Lottmann, Chad Kennedy, Chad Beebe, Walt Vernon, Dave Dagenais, Krista Biason and Jason Dantona. This Public Comment seeks to replace the First Draft Table 220.48 with two first level subdivisions to clarify there are optional demand factors in Article 517. A correlating Public Comment has been submitted to CMP15 to add new optional demand factors for general use receptacle loads in Category 1 and Category 2 patient care spaces in 517.22.

The CMP2/CMP15 task group was formed to resolve a correlation issue that resulted from actions taken during the first draft of the 2023 NEC. The task group was charged with proposing language that would resolve the correlation issue with feedback from CMP2, CMP15, and other key contributors. The recommended revision would place a permissive rule in Article 220 to point users to an optional method in Article 517 for patient care spaces in proposed 220.48(A). A new 220.48(B) is also proposed to point the user to the demand factors for diagnostic imaging and treatment equipment and to increase usability of the code.

Table 517.22(A) from the first draft was revised to be limited to Category 1 and Category 2 patient care spaces where the main issue of a large number of general use receptacles exists. Based on the large number of receptacles required in Category 1 and Category 2 patient care spaces and the data established as part of an NFPA Research Foundation project, this public comment offers a reasonable set of demand factors that can be applied when calculating the feeder and service loads for receptacle outlets in these patient care spaces. By making the use of this table a permissive application, as opposed to a mandatory requirement, the requirements of Article 220 can be applied if desired. A new Informational Note was added to direct users to 220.14(I) for the calculation of general-use receptacle loads. Table 517.22(B) from the first draft was removed as there was insufficient substantiation to justify applying demand factors to cord- and plug-connected loads served by individual branch circuits. A new Table 517.22(B), which essentially replicates the requirements from Article 220, is proposed to clarify how to apply demand factors for Category 3 and Category 4 patient care spaces.

The CMP2/CMP15 task group proposes this structure and the associated demand factors to represent a balanced view from both code making panels. The correlating committee placed purview under CMP2 for the demand factors and this task group is recommending this structure including; the permissive language in 220.48, locating the demand factor tables for general purpose receptacles in Category 1 and 2 and Category 3 and 4 patient care spaces in Article 517 and the removal of demand factor table for equipment fed by individual branch circuits. If any of these conditions change the task group requests the correlating committee reassess the purview.

Public Comment No. 560-NFPA 70-2021 [Section No. 220.48]

220.

~~48 Receptacle Loads —~~
48 Demand Factors for Health Care.

(A) Receptacle loads

~~calculated in accordance with 220.14(H) and (I)~~

for patient care spaces . Receptacle loads for patient care spaces in health care shall be permitted to be

~~subjected~~

made subject to the demand factors

~~provided in Table 220.48 for health care facilities covered in Article~~

given in 517.

~~**Table 220.48 Demand Factors for Health Care Receptacle Loads**~~

~~Portion of Receptacle Load to Which Demand Factor Applies (Volt-Amperes) Demand Factor (%) First 7500 or less 125 From 7501 to 10,000 100 From 10,001 to 15,000 50 Remainder over 15,000 45~~

~~22.~~

~~**(B) Demand factors for x-ray installations** . Demand factors for x-ray installations shall be permitted to be made subject to the demand factors given in 517.73~~

Statement of Problem and Substantiation for Public Comment

(Terraview made this messier than it needed to be) This comment was generated from discussion with the CMP-2 and CMP-15 task group, but I am not submitting this on behalf of the task group. This represents the consensus of the group that met prior to August 10th. This was submitted to ensure that a comment was made and the discussion can occur at the second draft meeting. The concept is that for patient care areas/spaces, that receptacle loads would be determined by CMP-15. All common loads that are not unique to health care occupancies would be as indicated in Article 220. This seems to make the most sense, to send users that are designing health care spaces to article 517 directly from article 220. This keeps the discussion on receptacle loads and limits the scope to only patient care spaces for CMP-15.

This change also includes a reference to x-ray loads that has existed for years and is often overlooked.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 561-NFPA 70-2021 [Section No. 517.22]	PC that includes section that this PC points the user to.
Public Comment No. 561-NFPA 70-2021 [Section No. 517.22]	

Related Item

• FR-9189 • FR-8222

Submitter Information Verification

Submitter Full Name:	Chad Beebe
Organization:	ASHE - AHA
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City:	
State:	
Zip:	
Submittal Date:	Fri Jul 30 12:08:07 EDT 2021
Committee:	NEC-P02

Public Comment No. 264-NFPA 70-2021 [Section No. 220.51]

220.51 Fixed Electric Space Heating.

Fixed electric space-heating loads shall be calculated at 100 percent of the total connected load. However, in no case shall a feeder or service load current rating be less than the rating of the largest branch circuit supplied.

Exception: ~~Where reduced~~ If reduced loading of the conductors results from units operating on duty-cycle, intermittently, or from all units not operating at the same time, the authority having jurisdiction ~~might grant~~ shall be permitted to grant permission for feeder and service conductors to have an ampacity less than 100 percent, provided the conductors have an ampacity for the load so determined.

Statement of Problem and Substantiation for Public Comment

Replacing the previous "may" with "might" does not bring the exception into compliance with the NEC Style Manual.
The correct term is "shall be permitted to" as is used in this Comment.
In addition, the use of the word "if" is required by the NEC Style Manual to indicate a conditional statement.

Related Item

- PI-3327

Submitter Information Verification

Submitter Full Name: Phil Simmons
Organization: Simmons Electrical Services
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Submittal Date: Sun Jul 18 20:00:49 EDT 2021
Committee: NEC-P02

Public Comment No. 265-NFPA 70-2021 [Section No. 220.53]

220.53 Appliance Load — Dwelling Unit(s).

Applying a demand factor of 75 percent to the nameplate rating load of four or more appliances rated ¼ hp or greater, or 500 watts or greater, that are fastened in place or occupy a dedicated location , and that are served by the same feeder or service in a one-family, two-family, or multifamily dwelling shall be permitted. This demand factor shall not apply to the following:

(1) Household electric cooking equipment that is ~~fastened in place~~

(2) ~~Clothes dryers~~
~~Space~~

(3) supplied by a 208- or 240-volt branch circuit

(4) Electric clothes dryers

(5) Electric space heating equipment

(6) Air-conditioning equipment

(7) Electric vehicle supply equipment (EVSE)

Statement of Problem and Substantiation for Public Comment

Unfortunately, the wording of this section lacks clarity and readability. This Comment is intended to be an editorial improvement rather than substantive.
Existing problems that are corrected by this Comment include:
1. With the existing wording "fastened in place", a freestanding electric range (occupies a dedicated location) can be included in the 75% demand factor that is identical in rating as one that is fastened in place that cannot be included. It seems this is not the intention of this permission.
2. Adding "supplied by a 208- or 240-volt branch circuit" excludes large electric cooking equipment such as ranges, cooktops and ovens but allows smaller equipment such as microwave ovens that are fastened in place.
3. Adding "electric" for clothes dryers excludes those clothes dryers but allows gas clothes dryers. Gas clothes dryers typically are permitted to be included in the list as the motor is typically 1/4 hp or larger.
4. Adding "electric" for space heating excludes that equipment but allows oil-fired space heating equipment to be included. Oil-fired space heating equipment (appliances) typically have motors rated 1/4 hp or greater.

Related Item

• PI-1449

Submitter Information Verification

Submitter Full Name:	Phil Simmons
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Submittal Date:	Sun Jul 18 20:11:25 EDT 2021
Committee:	NEC-P02

Public Comment No. 904-NFPA 70-2021 [Section No. 220.55]

220.55 Electric Cooking Appliances in Dwelling Units and Household Cooking Appliances Used in Instructional Programs.

The load for household electric ranges, wall-mounted ovens, counter-mounted cooking units, and other household cooking appliances individually rated in excess of 1¾ kW shall be permitted to be calculated in accordance with Table 220.55. Kilovolt-amperes (kVA) shall be considered equivalent to kilowatts (kW) for loads calculated under this section.

Where two or more single-phase ranges are supplied by a 3-phase, 4-wire feeder or service, the total load shall be calculated on the basis of twice the maximum number connected between any two phases.

Table 220.55 Demand Factors and Loads for Household Electric Ranges, Wall-Mounted Ovens, Counter-Mounted Cooking Units, and Other Household Cooking Appliances over 1¾ kW Rating (Column C to be used in all cases except as otherwise permitted in Note 3.)

Number of Appliances	Demand Factor (%) (See Notes)		Column C Maximum Demand (kW) (See Notes) (Not over 12 kW Rating)
	Column A (Less than 3½ kW Rating)	Column B (3½ kW through 8¾ kW Rating)	
1	80	80	8
2	75	65	11
3	70	55	14
4	66	50	17
5	62	45	20
6	59	43	21
7	56	40	22
8	53	36	23
9	51	35	24
10	49	34	25
11	47	32	26
12	45	32	27
13	43	32	28
14	41	32	29
15	40	32	30
16	39	28	31
17	38	28	32
18	37	28	33
19	36	28	34
20	35	28	35
21	34	26	36
22	33	26	37
23	32	26	38
24	31	26	39
25	30	26	40
26–30	30	24	15 kW + 1 kW for each range
31–40	30	22	
41–50	30	20	25 kW + ¾ kW for each range
51–60	30	18	
61 and over	30	16	

Notes:

1. *Over 12 kW through 27 kW ranges all of same rating.* For ranges individually rated more than 12 kW but not more than 27 kW, the maximum demand in Column C shall be increased 5 percent for each additional kilowatt of rating or major fraction thereof by which the rating of individual ranges exceeds 12 kW.

2. *Over 8¾ kW through 27 kW ranges of unequal ratings.* For ranges individually rated more than 8¾ kW and of different ratings, but none exceeding 27 kW, an average value of rating shall be calculated by adding together the ratings of all ranges to obtain the total connected load (using 12 kW for any range rated less than 12 kW) and dividing by the total number of ranges. Then the maximum demand in Column C shall be increased 5 percent for each kilowatt or major fraction thereof by which this average value exceeds 12 kW.

3. *Over 1¾ kW through 8¾ kW.* In lieu of the method provided in Column C, adding the nameplate ratings of all household cooking appliances rated more than 1¾ kW but not more than 8¾ kW and multiplying the sum by the demand factors specified in Column A or Column B for the given number of appliances shall be permitted. Where the rating of cooking appliances falls under both Column A and Column B, the demand factors for each column shall be applied to the appliances for that column, and the results added together.

4. Calculating the branch-circuit load for one range in accordance with Table 220.55 shall be permitted.

5. The branch-circuit load for one wall-mounted oven or one counter-mounted cooking unit shall be the nameplate rating of the appliance.

6. The branch-circuit load for a counter-mounted cooking unit and not more than two wall-mounted ovens, all supplied from a single branch circuit and located in the same room, shall be calculated by adding the nameplate rating of the individual

appliances and treating this total as equivalent to one range.

7. This table shall also apply to household cooking appliances rated over 1¾ kW and used in instructional programs.

Informational Note No. 1: See the examples in Informative Annex D.

Informational Note No. 2: See Table 220.56 for demand factors for commercial cooking equipment.

Additional Proposed Changes

File Name	Description	Approved
CN_134.pdf	70_CN134	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 134 appeared in the First Draft Report on First Revision No. 9163.

The Correlating Committee directs that the Panel rewrite the Informational Note No. 1 to Table 220.55 to comply with the NEC Style Manual, 4.1.3

Related Item

- First Revision No. 9163

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
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Submittal Date: Wed Aug 04 16:06:05 EDT 2021
Committee: NEC-P02

Correlating Committee Note No. 134-NFPA 70-2021 [Section No. 220.55]

Submitter Information Verification

Committee: NEC-AAC

Submittal Date: Tue May 04 15:54:48 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs that the Panel rewrite the Informational Note No. 1 to Table 220.55 to comply with the NEC Style Manual, 4.1.3

FR-9163-NFPA 70-2021

Ballot Results

✔ **This item has passed ballot**

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

Affirmative All

Ayer, Lawrence S.

Gallo, Ernest J.

Hickman, Palmer L.

Holub, Richard A.

Hunter, Dean C.

Johnston, Michael J.

Kendall, David H.

Kovacik, John R.

Manche, Alan

McDaniel, Roger D.

Porter, Christine T.

Williams, David A.

Public Comment No. 1672-NFPA 70-2021 [New Section after 220.57]

220.58 Marinas, Boatyards, Flotaing Buildings, and Commercial and Noncommercial Docking Facilities.

General lighting and other loads in marinas, boatyards, flotaing buildings, and commercial and noncommercial docking facilities, shall be calculated in accordance with Part III of Article 220, and, in addition, the demand factors set forth in Table 220.58 shall be permitted for each service and/or feeder circuit supplying receptacles that provide shore power for boats. These calculations shall be permitted to be modified as indicated in notes (1) and (2) to Table 220.58. Where demand factors of Table 220.58 are applied, the demand factor specified in 220.61(B) shall not be permitted.

Informational Note: These demand factors may be inadequate in areas of extreme hot or cold temperatures with loaded circuits for heating, air-conditioning, or refrigerating equipment.

Table 220.58 Demand Factors

Number of Shore Power Receptacles	Sum of the Rating of the Receptacles (%)
1–4	100
5–8	90
9–14	80
15–30	70
31–40	60
41–50	50
51–70	40
≥71	30

Notes:

1. Where shore power accommodations provide two receptacles specifically for an individual boat slip and these receptacles have different voltages (for example, one 30 ampere, 125 volt and one 50 ampere, 125/250 volt), only the receptacle with the larger kilowatt demand shall be required to be calculated.

2. If the facility being installed includes individual kilowatt-hour submeters for each slip and is being calculated using the criteria listed in Table 555.6, the total demand amperes shall be permitted to be multiplied by 0.9 to achieve the final demand amperes.

3. When a circuit feeding a boat hoist and shore power for the same boat slip is shared, only the load with the larger kilowatt demand shall be required to be counted in the load calculation.

Statement of Problem and Substantiation for Public Comment

This public comment does not seek to change the requirements for load calculations for marinas but rather relocate this section to Article 220. Article 220 is focused on load calculations and includes these calculations for many different installations throughout the NEC. It's important for any installer to understand that chapters 1 - 4 apply generally and that applies to Article 220. This should not be a challenge for those who design marinas as they should be very familiar with Chapters 1 - 4 of the NEC for many other reasons.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 1673-NFPA 70-2021 [Section No. 555.6]	
Public Comment No. 1673-NFPA 70-2021 [Section No. 555.6]	

Related Item

- FR 7912

Submitter Information Verification

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Submittal Date: Tue Aug 17 09:06:50 EDT 2021
Committee: NEC-P02

Public Comment No. 1342-NFPA 70-2021 [Section No. 220.57]

220.57 Electric Vehicle Supply Equipment (EVSE) Load.

The EVSE load shall be calculated at either ~~7200~~ 5760 watts (volt-amperes) or the nameplate rating of the equipment, whichever is larger. The load shall be considered to be continuous.

Informational Note: See 625.42 for sizing of an EVSE circuit.

Statement of Problem and Substantiation for Public Comment

Section 625.41 expressly requires these loads to be considered continuous in character. The 7200 VA parameter in the panel action would therefore need to be considered as 9000 VA when sizing conventional receptacles and circuit protection. This in turn would completely disqualify conventional circuit component sizing for this equipment, which is not substantiated. This comment preserves the VA format, and reiterates the continuous requirement, all of which support current system layouts.

Related Item

- FR-9170

Submitter Information Verification

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Submittal Date:	Thu Aug 12 08:25:32 EDT 2021
Committee:	NEC-P02

Public Comment No. 429-NFPA 70-2021 [Section No. 220.57]

220.57 Electric Vehicle Supply Equipment (EVSE) Load.

The EVSE load shall be calculated at either ~~7200~~ 5760 watts (volt-amperes) or the nameplate rating of the equipment, whichever is larger.

Informational Note: See 625.42 for sizing of an EVSE circuit.

Statement of Problem and Substantiation for Public Comment

EEI agrees to 7200 VA as a minimum; however, when combining the comments from FR-9182-NFPA 70-2021 that EVSE's should be considered Continuous Loads, the 7200 VA actually results in a 9000 VA minimum.

The actual maximum load on a 30 amp circuit is 24 amps continuous. So, the load should be calculated at 5760 VA and not 7200 VA. If calculated at 7200 plus 1.25 as a continuous load equates to the service and feed load calculation at 9000 VA.

Related Item

- FR-9182-NFPA 70-2021

Submitter Information Verification

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Submittal Date:	Tue Jul 27 14:25:31 EDT 2021
Committee:	NEC-P02

Public Comment No. 266-NFPA 70-2021 [Section No. 220.60]

220.60 Noncoincident Loads.

~~Where~~ If it is unlikely that two or more noncoincident loads will be in use simultaneously, ~~using only~~ the largest noncoincident load(s) ~~that will be used at one time for~~ shall be used for calculating the total load of a feeder or service. Each set of noncoincident loads shall be ~~permitted. Where a motor or air-conditioning load is part of the noncoincident load and is not the largest of the noncoincident loads, 125 percent of either the motor load~~ calculated individually. Each calculation shall comply with all applicable requirements of Part I, Part II and Part III of this Article including 250.50 for motor or air-conditioning load~~, whichever is larger, shall be used in the calculation~~ .

Statement of Problem and Substantiation for Public Comment

Changing "where" to "if" is intended to comply with the NEC Style Manual. "If" is required to be used to indicate a conditional statement while "where" is used to indicate a location.
Proposed changes are intended to improve the clarity of the requirements of this section to ensure that two calculations of each set of loads that cannot be used at the same time is performed. The largest set of loads is used in the applicable calculation and the smaller calculated load can be omitted.
In reality, load calculations of motor loads are covered in detail in 220.50 and repeating those provisions here is not really necessary.

Related Item

• PI-28, FR-9171

Submitter Information Verification

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Submittal Date: Sun Jul 18 20:42:52 EDT 2021
Committee: NEC-P02

Public Comment No. 905-NFPA 70-2021 [Section No. 220.61(B)]

(B) Permitted Reductions.

A service or feeder supplying the following loads shall be permitted to have an additional demand factor of 70 percent applied to the amount in 220.61(B)(1) and a portion of the amount in 220.61(B)(2) determined by the following basic calculations:

(1) Household Electric Ranges, Wall-Mounted Ovens, Counter-Mounted Cooking Units, and Dryers.

A feeder or service supplying household electric ranges, wall-mounted ovens, counter-mounted cooking units, and electric dryers, where the maximum unbalanced load has been determined in accordance with Table 220.55 for ranges and Table 220.54 for dryers.

(2) Unbalanced Load in Excess of 200 Amperes.

That portion of the unbalanced load in excess of 200 amperes where the feeder or service is supplied from a 3-wire dc or single-phase ac system; a 4-wire, 3-phase system; a 3-wire, 2-phase system; or a 5-wire, 2-phase system.

Informational Note: See Examples D1(a), D1(b), D2(b), D4(a), and D5(a) in Informative Annex D.

Additional Proposed Changes

File Name	Description	Approved
CN_135.pdf	70_CN135	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 135 appeared in the First Draft Report on First Revision No. 9178.

The Correlating Committee directs that the Panel rewrite the Informational Note to 220.61 (8)(2) to comply with the NEC Style Manual, 4.1.3.

Related Item

• First Revision No. 9178

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
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City:
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Submittal Date: Wed Aug 04 16:10:45 EDT 2021
Committee: NEC-P02

Correlating Committee Note No. 135-NFPA 70-2021 [Section No. 220.61(B)]

Submitter Information Verification

Committee: NEC-AAC
Submittal Date: Tue May 04 15:59:43 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs that the Panel rewrite the Informational Note to 220.61(B)(2) to comply with the NEC Style Manual, 4.1.3.

FR-9178-NFPA 70-2021

Ballot Results

✔ **This item has passed ballot**

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

Affirmative All

Ayer, Lawrence S.
Gallo, Ernest J.
Hickman, Palmer L.
Holub, Richard A.
Hunter, Dean C.
Johnston, Michael J.
Kendall, David H.
Kovacik, John R.
Manche, Alan
McDaniel, Roger D.
Porter, Christine T.
Williams, David A.

Public Comment No. 1039-NFPA 70-2021 [Section No. 220.70]

220.70 Energy Management Systems (EMSs).

If an energy management system (EMS) is used to limit the current to a feeder or service in accordance with 750.30 , a single value equal to the maximum ampere setpoint of the EMS shall be permitted to be used in load calculations for the feeder or service ~~where designated loads are controlled by the EMS and all of the following conditions are met:~~

(1) ~~Only listed EMS shall be permitted use of the load calculation allowance of this section.~~

(2) ~~Upon system malfunction, the EMS shall use monitoring and controls to disconnect the loads associated with the current limiting feature.~~

(3) ~~Access to the settings of the EMS shall be restricted to qualified personnel in accordance with the requirements of 240.6(C).~~

(4) ~~The equipment that supplies the feeder or service shall be field marked with the following information:~~

(5) ~~Maximum current setting~~

(6) ~~Date of calculation and setting~~

(7) ~~Identification of loads associated with the current limiting feature~~

(8) ~~The following or equivalent wording: "The setting for the EMS current limiting feature shall not be bypassed"~~

~~The markings shall meet the requirements in 110.21(B) and shall be located such that they are clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.~~

~~The~~ .

The setpoint value of the EMS shall be considered a continuous load for the purposes of load calculations. ~~In addition, loads not controlled by the EMS, but connected to the same feeder or service, shall be included in load calculations for that feeder or service as approved by other sections.~~

Statement of Problem and Substantiation for Public Comment

This public comment is submitted on behalf of the Energy Management Task Group formed under the direction of the Correlating Committee to review all current and proposed definitions and requirements related to load management, load management system, power control system, energy management system and related terms to ensure a coordinated approach throughout the Code. See CCN-279.

The task group members are; Chad Kennedy (Chair), Tim Zgonena, Rebekah Hren, Greg Ball, Jason Fisher, Doug Burkett, Robert Jordan, Matthew Grover, Tim Windey, Karl Reighard, and Brian Baughman. This task group of balanced interests provided the expertise to develop these public comments covering energy management across the NEC.

The energy management task group, as directed by the Correlating Committee, reviewed the requirements in this section and submits these adjustments to align with public comments to Article 750 and to eliminate redundancy. While the requirements added in FR-9172 are necessary, some of the requirements apply to the installation of the energy management system and should be located within Article 750.

This public comment is part of a series of actions recommended by the task group. See the related public comments which complete this action.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 36-NFPA 70-2021 [Definition: Energy Management System.]	
Public Comment No. 1034-NFPA 70-2021 [Definition: Load Management System.]	
Public Comment No. 1036-NFPA 70-2021 [Definition: Load Management.]	
Public Comment No. 1037-NFPA 70-2021 [Section No. 750.30]	
Public Comment No. 1048-NFPA 70-2021 [Section No. 708.22(B)]	
Public Comment No. 1049-NFPA 70-2021 [Section No. 705.80]	
Public Comment No. 1044-NFPA 70-2021 [Section No. 705.46]	
Public Comment No. 1050-NFPA 70-2021 [Section No. 705.28(A)]	
Public Comment No. 1043-NFPA 70-2021 [Section No. 705.13]	
Public Comment No. 1053-NFPA 70-2021 [Section No. 705.12 [Excluding any Sub-Sections]]	
Public Comment No. 1052-NFPA 70-2021 [Section No. 705.11(A)(1)]	
Public Comment No. 1045-NFPA 70-2021 [Section No. 700.4(C)]	
Public Comment No. 1046-NFPA 70-2021 [Section No. 701.4(C)]	
Public Comment No. 1047-NFPA 70-2021 [Section No. 702.4(B)]	

Public Comment No. 1041-NFPA 70-2021 [Section No. 625.42(A)]
Public Comment No. 1042-NFPA 70-2021 [Section No. 625.42(B)]
Public Comment No. 1406-NFPA 70-2021 [Section No. 230.82]
Public Comment No. 36-NFPA 70-2021 [Definition: Energy Management System.]
Public Comment No. 1034-NFPA 70-2021 [Definition: Load Management System.]
Public Comment No. 1036-NFPA 70-2021 [Definition: Load Management.]
Public Comment No. 1037-NFPA 70-2021 [Section No. 750.30]
Public Comment No. 1041-NFPA 70-2021 [Section No. 625.42(A)]
Public Comment No. 1042-NFPA 70-2021 [Section No. 625.42(B)]
Public Comment No. 1043-NFPA 70-2021 [Section No. 705.13]
Public Comment No. 1044-NFPA 70-2021 [Section No. 705.46]
Public Comment No. 1045-NFPA 70-2021 [Section No. 700.4(C)]
Public Comment No. 1046-NFPA 70-2021 [Section No. 701.4(C)]
Public Comment No. 1047-NFPA 70-2021 [Section No. 702.4(B)]
Public Comment No. 1048-NFPA 70-2021 [Section No. 708.22(B)]
Public Comment No. 1049-NFPA 70-2021 [Section No. 705.80]
Public Comment No. 1050-NFPA 70-2021 [Section No. 705.28(A)]
Public Comment No. 1052-NFPA 70-2021 [Section No. 705.11(A)(1)]
Public Comment No. 1053-NFPA 70-2021 [Section No. 705.12 [Excluding any Sub-Sections]]
Public Comment No. 1406-NFPA 70-2021 [Section No. 230.82]

Related Item

- CN-279

Submitter Information Verification

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Submittal Date: Thu Aug 05 22:05:54 EDT 2021
Committee: NEC-P02

Public Comment No. 1345-NFPA 70-2021 [Section No. 220.70]

220.70 Energy Management Systems (EMSs).

If an energy management system (EMS) is used to limit the current to a feeder or service, a single value equal to the maximum ampere setpoint of the EMS shall be permitted to be used in load calculations for the feeder or service where designated loads are controlled by the EMS and all of the following conditions are met:

(1) Only a listed EMS shall be permitted to use ~~of~~ the load calculation allowance ~~of~~ provided in this section.

(2) Upon system malfunction, the EMS shall use monitoring and controls to disconnect the loads associated with the current limiting feature.

(3) Access to the settings of the EMS shall be restricted to qualified personnel in accordance with the requirements of 240.6(C).

(4) The equipment that supplies the feeder or service shall be field marked with the following information:

a. Maximum current setting

b. Date of calculation and setting

c. Identification of loads associated with the current limiting feature

d. The following or equivalent wording: “The setting for the EMS current limiting feature shall not be bypassed”

The markings shall meet the requirements in 110.21(B) and shall be located such that they are clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.

The setpoint value of the EMS shall be considered a continuous load for the purposes of load calculations. In addition, loads not controlled by the EMS, but connected to the same feeder or service, shall be ~~included in load calculations for that~~ calculated as loads on the feeder or service ~~as approved by other sections~~ that are entirely additional to those calculated to loads supplied by the EMS .

Statement of Problem and Substantiation for Public Comment

This wording flows better, and avoids an incorrect and entirely inappropriate use of the defined term "approved."

Related Item

• FR-9172

Submitter Information Verification

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Submittal Date: Thu Aug 12 09:41:02 EDT 2021
Committee: NEC-P02

Public Comment No. 285-NFPA 70-2021 [New Article after 230]

Article 235 Branch Circuits Over 1000 VAC, 1500 VDC, Nominal

235.1 Scope.

This Article includes general requirements for installations for branch circuits over 1000 volts ac or 1500 volts dc, nominal.

235.3 Other Articles for Specific-Purpose Branch Circuits.

Table 235.3 lists references for specific equipment and applications not located in Chapters 5, 6, and 7 that amend or supplement the requirements of this article.

Equipment	Article	Section
Air-conditioning and refrigerating equipment	-	440.6, 440.31, and 440.32
Busways	-	368.17
Central heating equipment other than fixed electric space-heating equipment	-	422.12
Fixed electric heating equipment for pipelines and vessels	-	427.4
Fixed electric space-heating equipment	-	424.4
Fixed outdoor electrical deicing and snow-melting equipment	-	426.4
Infrared lamp industrial heating equipment	-	422.48,and 424.3
Motors, motor circuits, and controllers	430	-

235.5 Identification for Branch Circuits.

(A) Grounded Conductor.

The grounded conductor of a branch circuit shall be identified in accordance with 200.6.

(B) Equipment Grounding Conductor.

The equipment grounding conductor shall be identified in accordance with 250.119.

(C) Identification of Ungrounded Conductors.

Ungrounded conductors shall be identified in accordance with 235.5(C)(1) or (2), as applicable.

(1) Branch Circuits Supplied from More Than One Nominal Voltage System.

Where the premises wiring system has branch circuits supplied from more than one nominal voltage system, each ungrounded conductor of a branch circuit shall be identified by phase or line and by nominal system voltage at all termination, connection, and splice points in accordance with 235.5(C)(1)(a) and (C)(1)(b). Different systems within the same premises that have the same nominal voltage shall be permitted to use the same identification.

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 used for conductors originating within each branch-circuit panelboard or similar branch-circuit distribution equipment shall be documented in a manner that is readily available or shall be permanently posted at each branch-circuit panelboard or similar branch-circuit distribution equipment. The label shall be of sufficient durability to withstand the environment involved and shall not be handwritten.

Exception: In existing installations where a voltage system(s) already exists and a different voltage system is being added, it shall be permissible to mark only the new system voltage. Existing unidentified systems shall not be required to be identified at each termination, connection, and splice point in accordance with 235.5(C)(1)(a) and (C)(1)(b). Labeling shall be required at each voltage system distribution equipment to identify that only one voltage system has been marked for a new system(s). The new system label(s) shall include the words “other unidentified systems exist on the premises.”

(2) Branch Circuits Supplied from Direct-Current Systems.

Where a branch circuit is supplied from a dc system operating at more than 1500 volts, each ungrounded conductor of 4 AWG or larger shall be identified by polarity at all termination, connection, and splice points by marking tape, tagging, or other approved means; each ungrounded conductor of 6 AWG or smaller shall be identified by polarity at all termination, connection, and splice points in compliance with 235.5(C)(2)(a) and (b). The identification methods utilized for conductors originating within each branch-circuit panelboard or similar branch-circuit distribution equipment shall be documented in a manner that is readily available or shall be permanently posted at each branch-circuit panelboard or similar branch-circuit distribution equipment.

1. Positive Polarity, Sizes 6 AWG or Smaller. Where the positive polarity of a dc system does not serve as the connection point for the

grounded conductor, each positive ungrounded conductor shall be identified by one of the following means:

1. A continuous red outer finish

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

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

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

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

1. A continuous black outer finish

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

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

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

235.6 Branch-Circuit Voltage Limitations Over 1000 volts ac or 1500 volts dc Between Conductors.

Circuits exceeding 1000 volts ac or 1500 volts dc, nominal, between conductors shall be permitted to supply utilization equipment in installations where conditions of maintenance and supervision ensure that only qualified persons service the installation.

235.9 Circuits Derived from Autotransformers.

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

235.10 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 that have a grounded neutral conductor. Switching devices in each tapped circuit shall have a pole in each ungrounded conductor. All poles of multipole switching devices shall manually switch together where such switching devices also serve as a disconnecting means as required by the following:

(1) 410.93 for double-pole switched lampholders

(2) 410.104(B) for electric-discharge lamp auxiliary equipment switching devices

(3) 422.31(B) for an appliance

(4) 424.20 for a fixed electric space-heating unit

(5) 426.51 for electric deicing and snow-melting equipment

(6) 430.85 for a motor controller

(7) 430.103 for a motor

235.11 Branch Circuits Required.

The minimum number of branch circuits shall be determined from the total calculated load and the size or rating of the circuits used. In all installations, the number of circuits shall be sufficient to supply the load served.

235.18 Rating.

Branch circuits recognized by this article shall be rated in accordance with the maximum permitted ampere rating or setting of the overcurrent device. Where conductors of higher ampacity are used for any reason, the ampere rating or setting of the specified overcurrent device shall determine the circuit rating.

235.19 Conductors — Minimum Ampacity and Size.

The ampacity of conductors shall be in accordance with 310.14 and 315.60, as applicable. Branch-circuit conductors shall be sized in accordance with 235.19(A) or (B).

(A) General.

The ampacity of branch-circuit conductors shall not be less than 125 percent of the designed potential load of utilization equipment that will be operated simultaneously.

(B) Supervised Installations.

For supervised installations, branch-circuit conductor sizing shall be permitted to be determined by qualified persons under engineering supervision. Supervised installations are defined as those portions of a facility where both of the following conditions are met:

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

2. Qualified persons with documented training and experience in over 1000-volt ac or 1500-volt dc systems provide maintenance, monitoring, and servicing of the system.

235.20 Overcurrent Protection.

Branch-circuit conductors and equipment shall be protected by overcurrent protective devices that have a rating or setting that complies with 235.20 (A) through (C).

(A) Continuous and Noncontinuous Loads.

Where a branch circuit 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 branch circuit(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.

(B) Conductor Protection.

Conductors shall be protected in accordance with their ampacities specified in 310.14 or 315.60, as applicable.

(C) Equipment.

The rating or setting of the overcurrent protective device shall not exceed that specified in the applicable articles referenced in Table 240.3 for equipment.

235.22 Permissible Loads, Individual Branch Circuits.

An individual branch circuit shall be permitted to supply any load for which it is rated, but in no case shall the load exceed the branch-circuit ampere rating.

235.23 Permissible Loads, Multiple-Outlet Branch Circuits.

In no case shall the load exceed the branch-circuit ampere rating. A branch circuit supplying two or more outlets or receptacles shall supply only the loads specified according to its size in accordance with 210.23(A) through (E) and as summarized in 210.24.

(A) 15- and 20-Ampere Branch Circuits.

A 15- or 20-ampere branch circuit shall be permitted to supply lighting outlets, lighting units, or other utilization equipment, or any combination of them, and shall comply with 210.23(A)(1) and (A)(2).

(1) Cord-and-Plug-Connected Equipment Not Fastened in Place.

The rating of any one cord-and-plug-connected utilization equipment not fastened in place shall not exceed 80 percent of the branch-circuit ampere rating.

(2) Utilization Equipment Fastened in Place.

The total rating of utilization equipment fastened in place, other than luminaires, shall not exceed 50 percent of the branch-circuit ampere rating where lighting units, cord-and-plug-connected utilization equipment not fastened in place, or both, are also supplied.

(B) 30-Ampere Branch Circuits.

A 30-ampere branch circuit shall be permitted to supply fixed lighting units with heavy-duty lampholders in other than a dwelling unit(s) or utilization equipment in any occupancy. The rating of any one cord-and-plug-connected utilization equipment shall not exceed 80 percent of the branch-circuit ampere rating.

(C) 40- and 50-Ampere Branch Circuits.

A 40- or 50-ampere branch circuit shall be permitted to supply cooking appliances that are fastened in place in any occupancy. In other than dwelling units, such circuits shall be permitted to supply fixed lighting units with heavy-duty lampholders, infrared heating units, or other utilization equipment.

(D) Branch Circuits Larger Than 50 Amperes.

Branch circuits larger than 50 amperes shall supply only nonlighting outlet loads.

235.63 Equipment Requiring Servicing.

A 125-volt, single-phase, 15- or 20-ampere-rated receptacle outlet shall be instal led at an accessible location within 7.5 m (25 ft) of the equipment as specified in 210.63(A) and (B).

Informational Note: See 210.8(E) for requirements on GFCI protection.

(A) Heating, Air-Conditioning, and Refrigeration Equipment.

The required receptacle outlet shall be located on the same level as the heating, air-conditioning, and refrigeration equipment. The receptacle outlet shall not be connected to the load side of the equipment's branch-circuit disconnecting means.

Exception: A receptacle outlet shall not be required at one- and two-family dwellings for the service of evaporative coolers.

(B) Other Electrical Equipment.

In other than one- and two-family dwellings, a receptacle outlet shall be located as specified in 210.63(B)(1) and (B)(2).

(1) Indoor Service Equipment.

The required receptacle outlet shall be located within the same room or area as the service equipment.

(2) Indoor Equipment Requiring Dedicated Equipment Spaces.

Where equipment, other than service equipment, requires dedicated equipment space as specified in 110.26(E), the required receptacle outlet shall be located within the same room or area as the electrical equipment and shall not be connected to the load side of the equipment's disconnecting means.

Statement of Problem and Substantiation for Public Comment

This public comment is submitted on behalf of a correlating committee CMP 2 task group formulated to create a new Article 235 to cover requirements for branch circuits over 1000 Vac and 15000 Vdc. This task group consists of the following members: Thomas Domitrovich, Paul Barnhart, David Williams, Alan Manche, Mike Querry, Kevin Rogers, Roger McDaniel, Rod Belisle.
This new Article includes the requirements for medium voltage branch circuits. Sections that are applicable to medium voltage branch circuits have been copied and in some cases moved to this new article.
The following sections are included in this Article that have been removed from Article 210:
210.6(E) is now included in 235.6
210.19(B) and 210.19(E) are now included in 235.19

The following sections are duplicate to those that are in Article 210 but are included here to ensure completeness of this new Article 235. The requirements of each of these sections were reviewed for applicability to medium voltage branch circuits and modified accordingly without making technical changes modifying the existing requirements for medium voltage branch circuits.
210.9 has been included as part of 235.9
210.10 has been included as part of 235.10
210.11 has been included as part of 235.11
210.18 has been included as part of 235.18
210.20 has been included as part of 235.20
210.22 has been included as part of 235.22
210.23 has been included as part of 235.23
210.63 has been included as part of 235.63

Related Item

• FR 9180 • FR 9208 • FR 9298

Submitter Information Verification

Submitter Full Name: Thomas Domitrovich
Organization: Eaton Corporation
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City:
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Submittal Date: Mon Jul 19 19:08:35 EDT 2021
Committee: NEC-P02

Public Comment No. 556-NFPA 70-2021 [New Definition after Definition: Ground-Fault Circuit Inter...]

Ground-Fault Circuit Interrupter, Special Purpose (SPGFCI).

A device intended for the detection of ground-fault currents that functions to de-energize a circuit or portion of a circuit within an established period of time when a current to ground exceeds the values established for Class C, D, and E devices.

Informational Note: See UL 943C, Outline of Investigation for Special Purpose Ground-Fault Circuit Interrupters, for information on classes C, D, and E Special Purpose Ground-Fault Circuit Interrupters.

Statement of Problem and Substantiation for Public Comment

This public comment is submitted on behalf of a Correlating Committee task group established to review the term Ground-Fault Circuit Interrupter and other terminology associated with ground-fault protective equipment throughout the NEC to ensure consistency with how these are defined in Article 100. The Task Group consisted of members of CMP 2, 7, 10 and 17. Task group members include the following: Thomas Domitrovich, Robert Osborne, Keith Lofland, Danish Zia, Kevin Arnold, Marcelo Valdes, Vince Della Croce, and Wes Wheeler.

This definition is being added as this technology is now required in Article 680. A definition will add clarity for the user of the Code to properly select and apply these solutions to meet the new requirements.

The phrase "personnel protection" was not included in this definition. Though the thresholds for the current that these devices respond to may be below fibrillation thresholds, they are not below human let-go thresholds which are characteristically associated with personnel protection from shock hazards.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 292-NFPA 70-2021 [Section No. 680.5]	

Related Item

- FR 8418

Submitter Information Verification

Submitter Full Name: Thomas Domitrovich
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Submittal Date: Fri Jul 30 09:40:48 EDT 2021
Committee: NEC-P17

Public Comment No. 896-NFPA 70-2021 [Global Input]

The Correlating Committee directs all panels to change the Section titles pertaining to reconditioning to “Reconditioned Equipment.” and relocate the requirements to Section XXX.2 of the article if available or other section near the beginning of the article. If an article has multiple sections the panel should consider combining all reconditioning sections into subdivisions of XXX.2.

Additional Proposed Changes

File Name	Description	Approved
CN_259_Global.pdf	70_CN259	✓

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 259 appeared in the First Draft Report.

The Correlating Committee directs all panels to change the Section titles pertaining to reconditioning to “Reconditioned Equipment.” and relocate the requirements to Section XXX.2 of the article if available or other section near the beginning of the article. If an article has multiple sections the panel should consider combining all reconditioning sections into subdivisions of XXX.2.

Related Item

- Correlating Note No. 259

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 04 15:45:37 EDT 2021
Committee: NEC-P01

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

Modifications to Articles 215, 225, and 230, and additions to the new Article 235. See attached Word document

Additional Proposed Changes

File Name	Description	Approved
Global_PC_to_Create_235_215_225_and_230_to_235_.docx	PC to Expand Article 235 to include Feeder and Service Requirements	✓

Statement of Problem and Substantiation for Public Comment

This Public Comment is submitted on behalf of a Correlating Committee Long-Range Planning Task Group consisting of Robert Osborne (Chair), Paul Barnhart, Lou Grahor, David Temple, Donny Cook, Dean Hunter, Mike Querry, Roger McDaniel, Dave Burns, Rod Belisle, Tim Croushore, and Kevin Rogers.

This Public Comment, was developed with the goal of improving usability and providing a platform to increase the focus on requirements associated with Medium or High Voltage.

Reconsider PI 3819 which includes the combining of the branch-circuits, feeders, outside feeders and branch-circuits, and service installations "over 1000-volts", in the "new" Article 235.

The new Article 235 intended to be created by CMP 2 (refer to PC 285) locates the MV requirements in one location for usability and clarity. With the addition of Article 235 that only covers branch-circuits over 1000-volts, the proposed combining all of the requirements for "over 1000-volt" installations from Article 215, 225 and 230, provides an opportunity to create a consistent approach to address MV installations. The MV Task Group is concerned that failure to look at a long-term solution for systems over 1000-volts may create a vacuum in which other standards look to fill that void. Requirements for systems rated over 1000-volts are not arranged consistently within the document as covered by the Technical Committees.

As an example, CMP-10 addresses MV requirements in different locations within their purview. The "over 1000-volts" requirements exist in a dedicated "Part" within the Article – such is the case with existing Articles 225 and 230, and in Article 215, the "over 1000-volts" are intermingled with the "under 1000-volt" requirements. In addition, the specific requirements in Article 215 related to the sizing of feeder conductors using the 125% factor are located under the rules for 600 volts or less. Also, the requirement in section 215.3 for Overcurrent protection allows for 100% rated breakers and does not appear to correlate with the 215.2(B). The present layout is lacking in usability and clarity.

Related Item

• PI 3819 • FR 9180

Submitter Information Verification

Submitter Full Name: Robert Osborne
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Submittal Date: Fri Aug 13 08:42:11 EDT 2021
Committee: NEC-P10

Public Comment No. 1961-NFPA 70-2021 [Global Input]

The Correlating Committee directs all panels to review all references to Article 722 under their purview. Class 1 system in Article 725 has been relocated to Article 722. Each panel shall appoint a task group to review all necessary references to verify their accuracy and submit public comments where necessary.

Additional Proposed Changes

File Name	Description	Approved
CN_375_Global.pdf	70_CN375	✓

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 375 appeared in the First Draft Report.

The Correlating Committee directs all panels to review all references to Article 722 under their purview. Class 1 system in Article 725 has been relocated to Article 722. Each panel shall appoint a task group to review all necessary references to verify their accuracy and submit public comments where necessary.

Related Item

• Correlating Note No. 375

Submitter Information Verification

Submitter Full Name:	CC on NEC-AAC
Organization:	NEC Correlating Committee
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Submittal Date:	Wed Aug 18 20:37:05 EDT 2021
Committee:	NEC-P16

Public Comment No. 1964-NFPA 70-2021 [Global Input]

The Correlating Committee accepts the action taken by CMP 6 to create new Article 315 (FR 8616).

The Correlating Committee advises that article scope statements are the responsibility of the Correlating Committee and the Correlating Committee accepts the panel action.

The Correlating Committee directs all panels to review all references to Article 311 under their purview. Article 311 has been relocated to Article 315. Each panel shall appoint a task group to review all necessary references to verify their accuracy and submit Public Comments where necessary.

Additional Proposed Changes

File Name	Description	Approved
CN_390_Global.pdf	70_CN390	✓

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 390 appeared in the First Draft Report.

The Correlating Committee accepts the action taken by CMP 6 to create new Article 315 (FR 8616).

The Correlating Committee advises that article scope statements are the responsibility of the Correlating Committee and the Correlating Committee accepts the panel action.

The Correlating Committee directs all panels to review all references to Article 311 under their purview. Article 311 has been relocated to Article 315. Each panel shall appoint a task group to review all necessary references to verify their accuracy and submit Public Comments where necessary.

Related Item

- Correlating Note No. 390

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC

Organization: NEC Correlating Committee

Street Address:

City:

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Submittal Date: Wed Aug 18 20:44:11 EDT 2021

Committee: NEC-P06

Public Comment No. 462-NFPA 70-2021 [Global Input]

Corrosive Environment (As applied to Swimming Pools, Fountains, and Similar Installations). Areas or enclosures without ~~adequate~~ ventilation, where electrical equipment is located and pool sanitation chemicals are stored, handled, or dispensed. (680) (CMP-17).

Informational Note No 1.: See Advisory: Swimming Pool Chemical: Chlorine, OSWER 90- 008.1, June 1990, available from the EPA National Service Center for Environmental Publications (NSCEP) as sanitation chemicals and pool water are considered to pose a risk of corrosion (gradual damage or destruction of materials) due to the presence of oxidizers (e.g., calcium

hypochlorite, sodium hypochlorite, bromine, chlorinated isocyanurates) and chlorinating agents that release chlorine when dissolved in water.

Informational Note No. 2: See ANSI/APSP-11, Standard for Water Quality in Public Pools and Spas, ANSI/ASHRAE 62.1, Table 6-4 Minimum Exhaust Rates, and Section 324 of the 2021 International Swimming Pool and Spa Code (ISPSC), including associated definitions and requirements concerning adequate ventilation of indoor spaces such as equipment and chemical

storage rooms, which can reduce the likelihood of the accumulation of corrosive vapors. Chemicals such as chlorine cause severe corrosive and deteriorating effects on electrical connections, equipment, and enclosures when stored and kept in the same vicinity. (680) (CMP-17)

Luminaire, Cord-and-Plug-Connected. (Cord-and-Plug-Connected Luminaire). A

lighting assembly ~~consisting of a luminaire~~ intended for installation in the wall of a spa, hot tub, or storable pool, including a cord-and-plug-connected transformer. (680) (CMP-17)

Luminaire, Through-Wall (Through-Wall Luminaire). A lighting assembly intended for installation above grade, on or through the wall of a pool, consisting of twointerconnectedgroups of components separated by the pool wall. (680) (CMP- 17)

Resistance Heating Element. A specific separate element to generate heat that is externally attached to, embedded in, integrated with, or internal to the object to be heated.

Pool, Storable; used for Swimming, Wading or Immersion, Storable (Storable Swimming Wading or Immersion Pool). Swimming, wading or immersion pools installed entirely on or above the ground that are intended to be stored when not is use and are designed for ease of relocation. (680) (CMP-17)

Informational Note: Historically, a 1.07 m (42 in.) wall height accommodated most storable

swimming pools. Modern manufacturing methods have allowed storable pool manufacturers to increase wall heights while still permitting ease of assembly and disassembly of the pool.

Spa and Hot Tub, Storable. Spas and hot tubs installed entirely on or above the ground that are intended to be stored when not is use and are designed for ease of relocation. (680) (CMP-17)

Bodies of Water, Artificially Made (Artificially Made Bodies of Water). Bodies of water that have been constructed or modified to fit some decorative or commercial purpose such as, but not limited to, aeration ponds, fish farm ponds, storm retention basins, treatment ponds, and irrigation (channel) facilities. Water depths may vary seasonally or be controlled. (682) (CMP-17)

Bodies of Water, Natural (Natural Bodies of Water). Bodies of water such as lakes, streams, ponds, rivers, and other naturally occurring bodies of water, which may vary in depth throughout the year. (682) (CMP-17)

Electrically Powered Pool Lift. A fabricated unit that provides accessibility to and from a pool or spa for people with disabilities. (680) (CMP-17)

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Statement of Problem and Substantiation for Public Comment

CMP 17 Definitions Task Group proposes the modifications to comply with FR9274

Corrosive Environment — Swimming Pools, Fountains, and Similar Installations
The Correlating Committee directs that the definition of the term “corrosive environment” include parenthetical text (as applied to swimming pools, fountains, and similar installations). The use of “adequate ventilation” is vague and unenforceable requirement in a definition.
The Correlating Committee directs CMP 17 to provide clarity on what is meant by “adequate ventilation” as used in the definition.
2.2.2.3 Base Term
2.2.2.3.2 Article Number
EPA Chemical Emergency Preparedness and Prevention Advisory SWIMMING POOL CHEMICALS: Chlorine

CMP 17 Substantiation - The definition of Corrosive Environment is revised to comply with the NEC Style Manual. The definition has the parenthetical text added, and the term “adequate” as applied to ventilation has been removed as this is considered a vague and unenforceable term.

Lighting Assembly, Cord-and-Plug-Connected. (Cord-and-Plug-Connected Lighting Assembly

The Correlating Committee directs the panel to consider the term luminaire instead of lighting assembly for correlation of the document

CMP 17 Substantiation - The definition for “Lighting Assembly, Cord-and-Plug-Connected” was revised to provide additional clarity, and to utilize the term “luminaire” instead of “lighting assembly”. This is also consistent with the UL Marking Guide for Swimming Pool Equipment, Spas, Fountains and Hydromassage Bathtubs which utilizes the term “luminaire”.

Lighting Assembly, Through-Wall (Through-Wall Lighting Assembly).

The Correlating Committee directs the panel to consider the term luminaire instead of lighting assembly for correlation of the document.

CMP 17 Substantiation - The definition for “Lighting Assembly, Cord-and-Plug-Connected” was revised to provide additional clarity by utilizing the term “luminaire” instead of “lighting assembly”. This is also consistent with the UL Marking Guide for Swimming Pool Equipment, Spas, Fountains and Hydromassage Bathtubs which utilizes the term “luminaire”.

Resistance Heating Element.

The Correlating Committee directs the panel review and reconsider the wording of this definition relative to use of the word “may” as provided in Sections 3.1.1 and 3.2.1 of the NEC Style Manual.

CMP 17 Substantiation - The definition of Resistance Heating Element is revised to comply with the NEC Style Manual. The term “may” has been removed as this is considered a vague and unenforceable term.

Storable Swimming, Wading, or Immersion Pools; and Storable/Portable Spas and Hot Tubs.

Defined alternate terms shall be shown in accordance with 2.2.2.5 of the Style Manual. The Correlating Committee notes that "storable swimming, wading, or immersion pools" is not used in the document other than the title of Part III. This term might also be better grouped with pools as the base term so it is easy to locate the definition, in accordance with 2.2.2.3.

The Correlating Committee directs that CMP17 to review the use of the word “fully” in the context of the definition for clarity and usability. Ballot comments identified that the revised definition is missing two words. Add "and are" before "designed for ease of relocation." in the definition. The Correlating Committee directs that CMP-17 the wording in FR – 8413 be reviewed for and revised as determined necessary for clarity and ease of applying the requirement.

2.2.2.3 Base Term.
Group by Pool Pool, Storable. (Storable Pool)
2.2.2.5 Alternate Term

CMP 17 substantiation - For clarity the original definition was split into two definitions: one specific to storable pools and the other specific to storable spas and hot tubs.

The word “fully” has been replaced by “entirely” for clarification. “Entirely on” vs “entirely above” is a necessary distinction because storable spas and pools are often placed on elevated decks which may be multiple stories above the ground, and therefore are not “entirely on” the ground. Further, some pools and spas are partially buried in the ground and therefore are not considered storable under those conditions.

Also, added “and are” before “designed for ease of relocation” which improves clarity.

Artificially Made Bodies of Water.

2.2.2.3 Base Term
(Group by Bodies of Water)

CMP 17 substantiation - The definition is revised to comply with 2.2.2.3 of the NEC Style Manual, by using the base term “Bodies of Water” at start of the defined term, and adding parenthetical text with alternate terms.

Natural Bodies of Water.

2.2.2.3 Base Term
(Group by Bodies of Water)

CMP 17 substantiation - The definition is revised to comply with 2.2.2.3 of the NEC Style Manual, by using the base term “Bodies of Water” at start of the defined term, and adding parenthetical text with alternate terms.

Electrically Powered Pool Lift

2.2.2.2. Term in Definition

CMP 17 substantiation - The definition is revised to comply with 2.2.2.2 of the NEC Style Manual, by removing the word “lift” in the definition, as “lift” is part of the term being defined.

Related Item

- 9274

Submitter Information Verification

Submitter Full Name:	Dennis Querry
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Affiliation:	CMP 17 Definitions Task Group
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City:	
State:	
Zip:	
Submittal Date:	Tue Jul 27 18:12:34 EDT 2021
Committee:	NEC-P17

Public Comment No. 666-NFPA 70-2021 [Global Input]

The Correlating Committee directs the panel to review the reference to Article 450 in 724.40(A) for compliance in accordance with section 4.1.1 of the NEC Style Manual. It is not necessary to repeat requirements in Chapter 4.

The Correlating Committee directs the panel to review references to entire "Articles" and revise in accordance with section 4.1.4 of the NEC Style Manual.

The Correlating Committee directs the panel to reconsider the deleted text in 725.41 (B) for correlation with 300.3(C)(1) and the impact on these circuits occupying the same enclosure or raceway.

The Correlating Committee directs that FR-9591 be sent to CMP-3, CMP-11, CMP-9, CMP-12, CMP-13, CMP-18 for information.

The Correlating Committee directs that the Panel review the elimination of 725.41 (B) as it appears to have eliminated the ability to mix full voltage remote control and signaling circuits with Class 1.

The Correlating Committee further requests clarity with regard to the use and application of the terms remote-control, branch circuit and signaling circuit, branch circuit as it applies to the revisions in this new article that were formerly located in Part II of Article 725.

Additional Proposed Changes

File Name	Description	Approved
3_CN_368_Global.pdf	3 CN368	✓

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 368 appeared in the First Draft Report on First Revision No. 9591.

The Correlating Committee directs the panel to review the reference to Article 450 in 724.40(A) for compliance in accordance with section 4.1.1 of the NEC Style Manual. It is not necessary to repeat requirements in Chapter 4.

The Correlating Committee directs the panel to review references to entire "Articles" and revise in accordance with section 4.1.4 of the NEC Style Manual.

The Correlating Committee directs the panel to reconsider the deleted text in 725.41 (B) for correlation with 300.3(C)(1) and the impact on these circuits occupying the same enclosure or raceway.

The Correlating Committee directs that FR-9591 be sent to CMP-3, CMP-11, CMP-9, CMP-12, CMP-13, CMP-18 for information.

The Correlating Committee directs that the Panel review the elimination of 725.41 (B) as it appears to have eliminated the ability to mix full voltage remote control and signaling circuits with Class 1.

The Correlating Committee further requests clarity with regard to the use and application of the terms remote-control, branch circuit and signaling circuit, branch circuit as it applies to the revisions in this new article that were formerly located in Part II of Article 725.

Related Item

- First Revision No. 9591

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 03 09:02:36 EDT 2021
Committee: NEC-P03

that I have full power and authority to enter into this copyright assignment.

☑ By checking this box I affirm that I am CC on NEC-AAC, and I agree to be legally bound by the above Copyright Assignment and the terms and conditions contained therein. I understand and intend that, by checking this box, I am creating an electronic signature that will, upon my submission of this form, have the same legal force and effect as a handwritten signature

Public Comment No. 734-NFPA 70-2021 [Global Input]

The Correlating Committee directs this definition be correlated with the Article 324 and refer this first revision to Code Making Panel 6 for correlation.

Additional Proposed Changes

File Name	Description	Approved
3_CN_407_Global.pdf	3 CN407	✓

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 407 appeared in the First Draft Report on First Revision No. 9582.

The Correlating Committee directs this definition be correlated with the Article 324 and refer this first revision to Code Making Panel 6 for correlation.

Related Item

• First Revision No. 9582

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
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Submittal Date: Tue Aug 03 14:29:26 EDT 2021
Committee: NEC-P06

Public Comment No. 821-NFPA 70-2021 [Global Input]

The Correlating Committee establishes a Task Group with representation from Code-Making Panels 1, 3, 7, 12, 14, 15 and 17 to review the following definitions for possible revisions and combining definitions. The Task Group will also make necessary changes to comply with the NEC Style Manual for correlation. Each panel is assigned to revise the definitions under their purview to comply with the NEC Style Manual.

The Correlating Committee directs that FR 9274 be referred to CMP 3 for information regarding the definition for "Temporary Equipment".

Appliance, Fixed (CMP-7) 7690.

Appliance (CMP-17).

Appliance, Portable (CMP-7) 7690.

Equipment. (CMP-1).

Equipment, Portable (CMP-12)

Portable (CMP-12-17). 9396

Portable Equipment. (CMP-14-15-17). 8213

Mobile Equipment (CMP-14) 8748

Portable Power Distribution Unit. (CMP-15) 8640

Portable Structures (CMP-15)

Utilization Equipment (CMP-1)

Fastened-In-Place (CMP-12) 9473.

Fixed-In-Place (CMP-12) 9393.

Temporary Equipment (CMP-12) 9274

Additional Proposed Changes

File Name	Description	Approved
7_CN_393_Global.pdf	7 CN393	✓

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 393 appeared in the First Draft Report on First Revision Nos. 7690, 9396, 8213, 8748, 8640, 9473 and 9393.

The Correlating Committee establishes a Task Group with representation from Code-Making Panels 1, 3, 7, 12, 14, 15 and 17 to review the following definitions for possible revisions and combining definitions. The Task Group will also make necessary changes to comply with the NEC Style Manual for correlation. Each panel is assigned to revise the definitions under their purview to comply with the NEC Style Manual.

The Correlating Committee directs that FR 9274 be referred to CMP 3 for information regarding the definition for "Temporary Equipment".

Appliance, Fixed (CMP-7) 7690.

Appliance (CMP-17).

Appliance, Portable (CMP-7) 7690.

Equipment. (CMP-1).

Equipment, Portable (CMP-12)

Portable (CMP-12-17). 9396

Portable Equipment. (CMP-14-15-17). 8213

Mobile Equipment (CMP-14) 8748

Portable Power Distribution Unit. (CMP-15) 8640

Portable Structures (CMP-15)

Utilization Equipment (CMP-1)

Fastened-In-Place (CMP-12) 9473.

Fixed-In-Place (CMP-12) 9393.

Temporary Equipment (CMP-12) 9274

Related Item

- First Revision No. 7690
- First Revision No. 9396
- First Revision No. 8213
- First Revision No. 8748
- First Revision No. 8640
- First Revision No. 9473
- First Revision No. 9393

Submitter Information Verification

Submitter Full Name:	CC on NEC-AAC
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Submittal Date:	Wed Aug 04 12:36:47 EDT 2021
Committee:	NEC-P17

Public Comment No. 896-NFPA 70-2021 [Global Input]

The Correlating Committee directs all panels to change the Section titles pertaining to reconditioning to "Reconditioned Equipment." and relocate the requirements to Section XXX.2 of the article if available or other section near the beginning of the article. If an article has multiple sections the panel should consider combining all reconditioning sections into subdivisions of XXX.2.

Additional Proposed Changes

File Name	Description	Approved
CN_259_Global.pdf	70_CN259	✓

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 259 appeared in the First Draft Report.

The Correlating Committee directs all panels to change the Section titles pertaining to reconditioning to "Reconditioned Equipment." and relocate the requirements to Section XXX.2 of the article if available or other section near the beginning of the article. If an article has multiple sections the panel should consider combining all reconditioning sections into subdivisions of XXX.2.

Related Item

- Correlating Note No. 259

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
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Submittal Date: Wed Aug 04 15:45:37 EDT 2021
Committee: NEC-P01

Public Comment No. 1961-NFPA 70-2021 [Global Input]

The Correlating Committee directs all panels to review all references to Article 722 under their purview. Class 1 system in Article 725 has been relocated to Article 722. Each panel shall appoint a task group to review all necessary references to verify their accuracy and submit public comments where necessary.

Additional Proposed Changes

File Name	Description	Approved
CN_375_Global.pdf	70_CN375	✓

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 375 appeared in the First Draft Report.

The Correlating Committee directs all panels to review all references to Article 722 under their purview. Class 1 system in Article 725 has been relocated to Article 722. Each panel shall appoint a task group to review all necessary references to verify their accuracy and submit public comments where necessary.

Related Item

- Correlating Note No. 375

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
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Street Address:
City:
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Submittal Date: Wed Aug 18 20:37:05 EDT 2021
Committee: NEC-P16

Public Comment No. 1964-NFPA 70-2021 [Global Input]

The Correlating Committee accepts the action taken by CMP 6 to create new Article 315 (FR 8616).

The Correlating Committee advises that article scope statements are the responsibility of the Correlating Committee and the Correlating Committee accepts the panel action.

The Correlating Committee directs all panels to review all references to Article 311 under their purview. Article 311 has been relocated to Article 315. Each panel shall appoint a task group to review all necessary references to verify their accuracy and submit Public Comments where necessary.

Additional Proposed Changes

File Name	Description	Approved
CN_390_Global.pdf	70_CN390	✓

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 390 appeared in the First Draft Report.

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Related Item

- Correlating Note No. 390

Submitter Information Verification

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