Public Comment No. 1027-NFPA 70-2021 [Global Input]

The Correlating Committee notes that more than one related term is referenced in the definitions. Section 2.2.2.4 of the NEC Style Manual review this issue and the Correlating Committee establishes a Task Group with representation from Code-Making Panels 1, 15 and 16 to combine the terms where possible and to revise the definitions to comply with the NEC Style Manual. The four terms of "Exposed" and the term "Exposed Conductive Surfaces" need to be revised for correlation. Each panel is assigned to revise the definitions under their purview to comply with the NEC Style Manual.

Additional Proposed Changes

File Name	Description	Approved
15_CN_401_Global.pdf	70_CN401	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 401 appeared in the First Draft Report on First Revision No. 8683.

The Correlating Committee notes that more than one related term is referenced in the definitions. Section 2.2.2.4 of the NEC Style Manual review this issue and the Correlating Committee establishes a Task Group with representation from Code-Making Panels 1, 15 and 16 to combine the terms where possible and to revise the definitions to comply with the NEC Style Manual. The four terms of "Exposed" and the term "Exposed Conductive Surfaces" need to be revised for correlation. Each panel is assigned to revise the definitions under their purview to comply with the NEC Style Manual.

Related Item

• First Revision No. 8683

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 05 20:09:24 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected
Resolution: No action was necessary to the definitions of exposed under the purview of CMP-1.

Public Comment No. 1027-NFPA 70-2021 [Global Input]

The Correlating Committee notes that more than one related term is referenced in the definitions. Section 2.2.2.4 of the NEC Style Manual review this issue and the Correlating Committee establishes a Task Group with representation from Code-Making Panels 1, 15 and 16 to combine the terms where possible and to revise the definitions to comply with the NEC Style Manual. The four terms of "Exposed" and the term "Exposed Conductive Surfaces" need to be revised for correlation. Each panel is assigned to revise the definitions under their purview to comply with the NEC Style Manual.

Additional Proposed Changes

File Name	Description	Approved
15_CN_401_Global.pdf	70_CN401	✓

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 401 appeared in the First Draft Report on First Revision No. 8683.

The Correlating Committee notes that more than one related term is referenced in the definitions. Section 2.2.2.4 of the NEC Style Manual review this issue and the Correlating Committee establishes a Task Group with representation from Code-Making Panels 1, 15 and 16 to combine the terms where possible and to revise the definitions to comply with the NEC Style Manual. The four terms of "Exposed" and the term "Exposed Conductive Surfaces" need to be revised for correlation. Each panel is assigned to revise the definitions under their purview to comply with the NEC Style Manual.

Related Item

- First Revision No. 8683

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 05 20:09:24 EDT 2021
Committee: NEC-P01

Copyright Assignment

I, CC on NEC-AAC, hereby irrevocably grant and assign to the National Fire Protection Association (NFPA) all and full rights in copyright in this Public Comment (including both the Proposed Change and the Statement of Problem and Substantiation). I understand and intend that I acquire no rights, including rights as a joint author, in any publication of the NFPA in which this Public Comment in this or another similar or derivative form is used. I hereby warrant that I am the author of this Public Comment and 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. 1893-NFPA 70-2021 [Global Input]

Create a new Annex XX that contains the titles of all XXX.2 definitions in numerical sequence by Article.

Statement of Problem and Substantiation for Public Comment

: It is a significant change to locate all definitions in Article 100, and to promote usability and support the transition to all definitions being relocated to Article 100, the creation of a new Annex is proposed. The new Annex does not constitute new material but builds on the work this cycle by all NEC Code panels on relocating definitions. Even though Article 100 is set up alphabetical order, it would be very useful to have the former .2 defined terms (titles only) appear in numerical sequence under each article in this annex.

Example:

Article 517
Alternate Power Source
Ambulatory Health Care Occupancy
Anesthetizing Location
Battery-Powered Lighting Units
…and so forth

The objective of this annex would be to include just the defined terms or words only under each article designation. This comment responds to various concerns expressed in ballot statements that include similar suggestions.

Related Item

• FR 8496, 8497, 8498, FCR 352

Submitter Information Verification

Submitter Full Name: Agnieszka Golriz
Organization: NECA
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 18 13:49:45 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected
Resolution: The proposed material is better suited in training materials.

Public Comment No. 637-NFPA 70-2021 [Global Input]

The Correlating Committee directs the Chair of CMP-1 to assign a task group to review all the definitions under their purview for compliance with the NEC Style Manual and to review definitions identified by the Correlating Committee that may contain correlation issues. The attachment includes a list of those definitions identified that need to be reviewed.

Additional Proposed Changes

File Name	Description	Approved
1_CN_447.pdf	70_CN447	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 447 appeared in the First Draft Report.

The Correlating Committee directs the Chair of CMP-1 to assign a task group to review all the definitions under their purview for compliance with the NEC Style Manual and to review definitions identified by the Correlating Committee that may contain correlation issues. The attachment includes a list of those definitions identified that need to be reviewed.

Related Item

- Correlating Note No. 447

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 02 16:13:13 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7841-NFPA 70-2021
Statement: CMP-1 has addressed the NEC Style Manual compliance issues in the definitions.

Correlating Committee Note No. 447-NFPA 70-2021 [Part I.]

Supplemental Information

File Name	Description	Approved
NEC_P01_Definitions_TG_Attachment_CN447.docx		

Submitter Information Verification

Committee: NEC-AAC
Submittal Date: Mon May 10 13:26:56 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs the Chair of CMP-1 to assign a task group to review all the definitions under their purview for compliance with the NEC Style Manual and to review definitions identified by the Correlating Committee that may contain correlation issues. The attachment includes a list of those definitions identified that need to be reviewed.

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.

Correlating Committee Definitions Task Group
CMP-1 – Definitions

CMP-1 Definitions	Correlating Committee Comments
	The Correlating Committee directs the Chair of CMP-1 to assign a task group to review all the definitions under their purview for compliance with the NEC Style Manual and to review definitions identified by the Correlating Committee that may contain correlation issues. The attachment includes a list of those definitions identified that need to be reviewed.
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)	2.2.2.2 Requirement in Definition
Occupiable Space. A room or enclosed space designed for human occupancy. (CMP-1)	Reconsider the FR As defined in the Building Code. Only used in 404.2(C)
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)	The Correlating Committee assigns the definition "Panelboard, Enclosed. (Enclosed Panelboard) to CMP-9.
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.	The Correlating Committee assigns the definition Reconditioned to CMP-1.
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)	Task Group 9 Disconnecting Means 2.2.2.4 Multiple Terms
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)	Task Group 3 Appliances-Equipment-Portable Issues

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.	Task Group 11 Exposed Issues 2.2.2.4 Multiple Terms
Exposed (as applied to wiring methods). On or attached to the surface or behind panels designed to allow access. (CMP-1)	Task Group 11 Exposed Issues 2.2.2.4 Multiple Terms
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)	Task Group 12 Industrial Establishment - Supervised Industrial Installation The Correlating Committee assigns the definition of Industrial Establishment to CMP-1.
Premises. The land and buildings of a user located on the user side of the utility-user network point of demarcation. (800) (CMP-16	Task Group 14 CMP-1 and CMP-16 The definition of Premises is assigned to CMP-1
Utilization Equipment. Equipment that utilizes electric energy for electronic, electromechanical, chemical, heating, lighting, or similar purposes. (CMP-1)	Task Group 3 Appliances-Equipment-Portable Issues 2.2.2.3 Base Term
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)	2.2.2.3.1 Searchable Title Suggest: (Pressure Connector)
Duty, Continuous. Operation at a substantially constant load for an indefinitely long time. (CMP-1)	2.2.2.3.1 Searchable Title Suggest: (Continuous Duty)
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)	2.1.5.1 Lists 2.2.2.3.1 Searchable Title Suggest: (Intermittent Duty)
Duty, Periodic. Intermittent operation in which the load conditions are regularly recurrent. (CMP-1)	2.2.2.3.1 Searchable Title Suggest: (Periodic Duty)
Duty, Short-Time. Operation at a substantially constant load for a short and definite, specified time. (CMP-1)	2.2.2.3.1 Searchable Title Suggest: (Short-Time Duty)
Duty, Varying. Operation at loads, and for intervals of time, both of which may be subject to wide variation. (CMP-1)	2.2.2.3.1 Searchable Title Suggest: (Varying Duty)

Dwelling, One-Family. A building that consists solely of one dwelling unit. (CMP-1)	2.2.2.3.1 Searchable Title Suggest: (One-Family Dwelling)
Dwelling, Two-Family. A building that consists solely of two dwelling units. (CMP-1)	2.2.2.3.1 Searchable Title Suggest: (Two-Family Dwelling)
Dwelling, Multifamily. A building that contains three or more dwelling units. (CMP-1)	2.2.2.3.1 Searchable Title Suggest: (Multifamily Dwelling)
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.	4.3.2.3 Extract Reference 4.1.3 Reference Structure
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)	4.3.2.3 Extract Reference
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.	2.2.2.3.1 Searchable Title Suggest: (Damp Location)
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)	2.2.2.3.1 Searchable Title Suggest: (Dry Location)
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.	2.2.2.3.1 Searchable Title Suggest: (Wet Location)
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	2.2.2.1 List 2.1.5.1. List Format

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.	
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.	4.1.3 informational Note Format
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).	2.2.2.3.1 Searchable Title Suggest: (Nominal Voltage) 2.2.2.4. Multiple Terms Nominal Voltage

Public Comment No. 646-NFPA 70-2021 [Global Input]

Type your content here ...
ReL P.I. 368 (global): Yes please, NFPA staff, look at providing more guidance in headers as to the nature of page contents.

Statement of Problem and Substantiation for Public Comment

Not only will this save considerable time for users who haven't memorized Section numbers, but it will minimize some errors. I've invested in stick-on tabs, but they didn't do the job for me.

Related Item

• PI 368

Submitter Information Verification

Submitter Full Name: David Shapiro
Organization: Safety First Electrical
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 02 20:35:21 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected
Resolution: CMP-1 reiterates their statement that the format and language used in the Code follows the NEC Style Manual.

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

Committee Statement

Committee Action: Rejected
Resolution: The section title pertaining to "Reconditioned Equipment" is correct and located appropriately in 110.20.

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. 590-NFPA 70-2021 [Section No. 90.1]

90.1 Scope.

This article covers use and application, arrangement, and enforcement of this *Code*. It also covers the expression of mandatory, permissive, and nonmandatory text, provides guidance on the examination of equipment and on wiring planning, and specifies the use and expression of measurements.

Additional Proposed Changes

File Name	Description	Approved
1_CN_100.pdf	70_CN100	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 100 appeared in the First Draft Report on First Revision No. 9426.

The Correlating Committee advises that article scope statements are the responsibility of the Correlating Committee and the Correlating Committee accepts the panel action.

Related Item

• First Revision No. 9426

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 02 10:03:45 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected
Resolution: CMP-1 understands that approval of Scope statements is the responsibility of the National Electrical Code Correlating Committee and acknowledges CC Note No. 100.

Correlating Committee Note No. 100-NFPA 70-2021 [New Section after 90.1]

Submitter Information Verification

Committee: NEC-P01
Submittal Date: Tue May 04 11:42:28 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee advises that article scope statements are the responsibility of the Correlating Committee and the Correlating Committee accepts the panel action.

First Revision No. 9426-NFPA 70-2021 [New Section after 90.1]

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. 591-NFPA 70-2021 [Section No. 90.2(E)]

(E) Relation to Other International Standards.

The requirements in this *Code* address the fundamental principles of protection for safety contained in Section 131 of International Electrotechnical Commission Standard 60364-1, *Electrical Installations of Buildings*.

Informational Note: IEC 60364-1, Section 131, contains fundamental principles of protection for safety that encompass protection against electric shock, protection against thermal effects, protection against overcurrent, protection against fault currents, and protection against overvoltage. All of these potential hazards are addressed by the requirements in this *Code*.

Additional Proposed Changes

File Name	Description	Approved
1_CN_101_Global.pdf	70_CN101	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 101 appeared in the First Draft Report on First Revisions No. 9463.

The Correlating Committee directs that this first revision be rewritten to comply with the NEC Style Manual, Section 4.1.3 Reference Structure, 90.2(E) Informational Note.

Related Item

• First Revision No. 9463

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 02 10:20:17 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7534-NFPA 70-2021
Statement: The title of IEC 60364-1 is revised for accuracy. The informational note is revised to comply with the NEC Style Manual.

Correlating Committee Note No. 101-NFPA 70-2021 [Global Input]

Submitter Information Verification

Committee: NEC-P01
Submittal Date: Tue May 04 11:44:50 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs that this first revision be rewritten to comply with the NEC Style Manual, Section 4.1.3 Reference Structure, 90.2(E) Informational Note.

First Revision No. 9463-NFPA 70-2021 [Global Input]

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. 584-NFPA 70-2021 [Section No. 90.7]

90.7 Examination of Equipment for Safety.

For specific items of equipment and materials referred to in this *Code*, examinations for safety made under standard conditions provide a basis for approval where the record is made generally available through promulgation by organizations properly equipped and qualified for experimental testing, inspections of the run of goods at factories, and service-value determination through field inspections. This avoids the necessity for repetition of examinations by different examiners, frequently with inadequate facilities for such work, and the confusion that would result from conflicting reports on the suitability of devices and materials examined for a given purpose.

It is the intent of this *Code* that factory-installed internal wiring or the construction of equipment need not be inspected at the time of installation of the equipment, except to detect alterations or damage, if the equipment has been listed by a qualified electrical testing laboratory that is recognized as having the facilities described in the preceding paragraph and that requires suitability for installation in accordance with this *Code*. Suitability shall be determined by application of requirements that are compatible with this *Code*.

Informational Note No. 1: See requirements in 110.3.

Informational Note No. 2: *Listed* ~~is~~ and Reconditioned are defined in Article 100..

Informational Note No. 3: See Informative Annex A for a list of product safety standards that are compatible with this *Code*.

Statement of Problem and Substantiation for Public Comment

Inasmuch as this concerns ways in which equipment is prepared for installation, if it is deemed useful to point to Article 100's definition of "Listed," it is similarly useful to point to the definition of "Reconditioned." That could deal with the concern over compliant reconditioned equioment being mistaken for OEM-listed equipment.

Related Item

• PI 1941

Submitter Information Verification

Submitter Full Name: David Shapiro
Organization: Safety First Electrical
Street Address:
City:
State:
Zip:
Submittal Date: Sun Aug 01 14:17:02 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7537-NFPA 70-2021
Statement: Informational Notes No.1 and 2 are revised to comply with the NEC Style Manual and to add “reconditioned” to note No. 2.

Public Comment No. 594-NFPA 70-2021 [Section No. 90.7]

90.7 Examination of Equipment for Safety.

For specific items of equipment and materials referred to in this *Code*, examinations for safety made under standard conditions provide a basis for approval where the record is made generally available through promulgation by organizations properly equipped and qualified for experimental testing, inspections of the run of goods at factories, and service-value determination through field inspections. This avoids the necessity for repetition of examinations by different examiners, frequently with inadequate facilities for such work, and the confusion that would result from conflicting reports on the suitability of devices and materials examined for a given purpose.

It is the intent of this *Code* that factory-installed internal wiring or the construction of equipment need not be inspected at the time of installation of the equipment, except to detect alterations or damage, if the equipment has been listed by a qualified electrical testing laboratory that is recognized as having the facilities described in the preceding paragraph and that requires suitability for installation in accordance with this *Code*. Suitability shall be determined by application of requirements that are compatible with this *Code*.

Informational Note No. 1: See requirements in 110.3.

Informational Note No. 2: *Listed* is defined in Article 100.

Informational Note No. 3: See Informative Annex A for a list of product safety standards that are compatible with this *Code*.

Additional Proposed Changes

File Name	Description	Approved
1_CN_102.pdf	70_CN102	

Statement of Problem and Substantiation for Public Comment

The following CC Note No. 102 appeared in the First Draft Report on First Revisions No. 8381.

The Correlating Committee directs that this first revision be rewritten to comply with the NEC Style Manual, Section 4.1.3 Reference Structure. Informational Notes 1 and 2 need to be revised.

Related Item

• First Revision No. 8381

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 02 11:22:57 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR

Resolution:	SR-7537-NFPA 70-2021
Statement:	Informational Notes No.1 and 2 are revised to comply with the NEC Style Manual and to add “reconditioned” to note No. 2.

Correlating Committee Note No. 102-NFPA 70-2021 [Section No. 90.7]

Submitter Information Verification

Committee: NEC-P01
Submittal Date: Tue May 04 11:46:31 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs that this first revision be rewritten to comply with the NEC Style Manual, Section 4.1.3 Reference Structure. Informational Notes 1 and 2 need to be revised.

First Revision No. 8381-NFPA 70-2021 [Section No. 90.7]

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. 1253-NFPA 70-2021 [Section No. 90.9(B)]

(B) Dual System of Units.

~~SI units shall appear first, and inch-pound units shall immediately follow in parentheses.~~

Conversion from inch-pound units to SI units shall be based on hard conversion except as provided in 90.9(C) .

~~*Exception: The tables located in Informative Annex C shall be permitted to list the trade sizes before SI units.*~~

Statement of Problem and Substantiation for Public Comment

Section 3.2.7.1 of the 2020 style manual already addresses this. If we delete the mandatory language in this section and simply let the style manual handle it we can delete the proposed exception as well.

Related Item

• FR 8390

Submitter Information Verification

Submitter Full Name: Ryan Jackson
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Submittal Date: Wed Aug 11 13:43:30 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: The format and language used in the Code follows the NEC Style Manual. The text following the title of (B) Dual System of Units, provides guidance as to how SI and metric shall appear in the Code.

Public Comment No. 1225-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)

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)

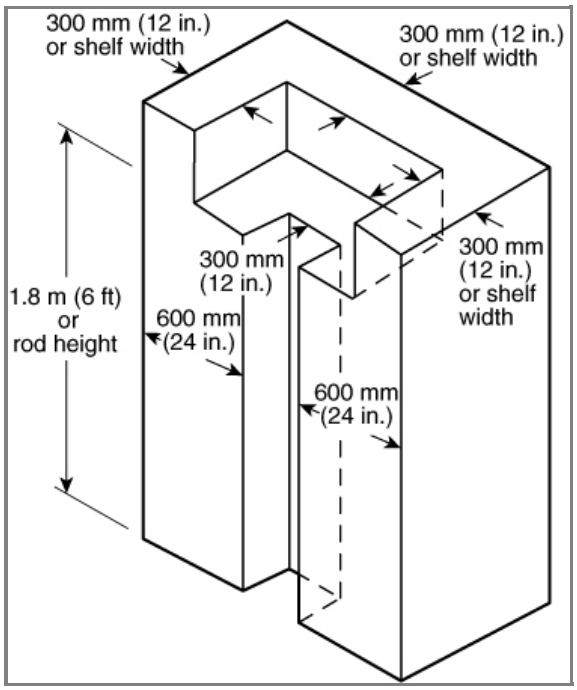
Clothes Closet.

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.

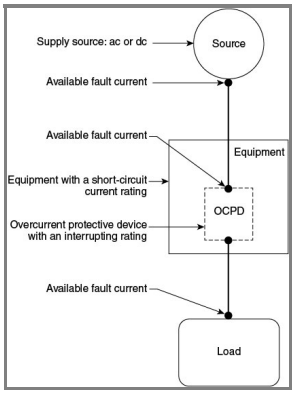
The current delivered at a point on the system during a short-circuit condition. (CMP-10)

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 (1⅜ 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

I am requesting this change to the definitions be reverted, or that the possible alternatives below be considered:

A user friendly NEC results in more safe installations. The moving of the definitions will reduce user friendliness. For some definitions, they should only apply in 1 article, as they are truly special to that article. Safety is enhanced when those who have need to know can review a relevant special article before starting on a task. For not commonly used definitions, they nolonger will be easily able to review specific definitions applicable to only a specific article.
We also likely have some definitions being relocated to article 100, that have terms that only mean a certain thing in one article. Seeing the small article number at the end of the definition in this case is not enough to make a user friendly NEC.

If we need to do something different with the definitions section, perhaps we should have the first part of the definitions section be all definitions applicable generally, followed by an alphabetical grouping on a per article basis, with those definitions applicable only to one article. If we can't do this, perhaps at a minimum we should have some formatting, such that all terms having a definition be underlined in the NEC.

The current definitions section likely will create a market for a separate publication as a more user friendly guideline to the definitions in the NEC. We should instead be working to make a user friendly NEC, that would be adequate on its own in many respects for the qualified person.

This change seems to have been made with little if any public input or representation. It seems to have come about because it was said that the definitions section was against the NEC style manual. A committee was directed to "consider" and their statement on this change was simply that it was not their jurisdiction to object. It seems in reality there was no consideration, even though that was what was directed of the committee.

Perhaps the NEC style manual is what needs to change here, and not the NEC.

Related Item

• First Revision No. 8497-NFPA 70-2021 [Part II.]

Submitter Information Verification

Submitter Full Name: Josh Weaver
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Submittal Date: Tue Aug 10 21:57:43 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: The location of all definitions in Article 100 does not change how the term is applied in any Article. The Public Comment does not meet the requirements of Section 4.4.4 of Regulations Governing the Development of NFPA Standards.

Public Comment No. 217-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 1: 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*

Informational Note 2: See Infomational Annex K for a list of article-specific defintions sorted by article.

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)

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)

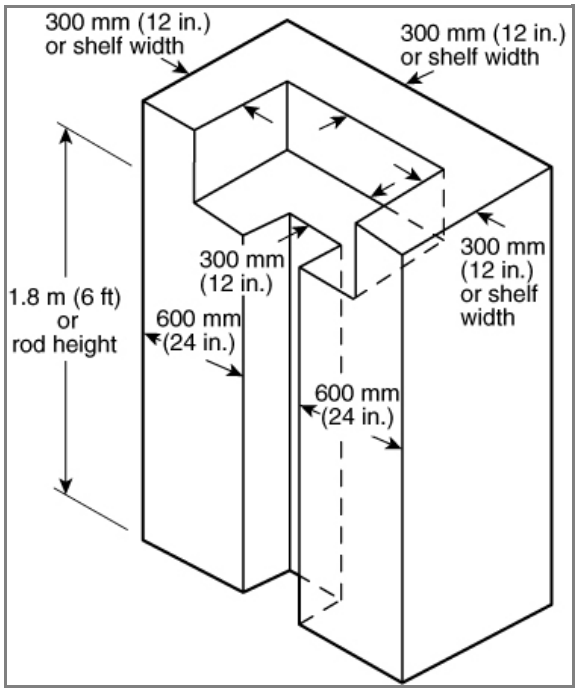
Clothes Closet.

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.

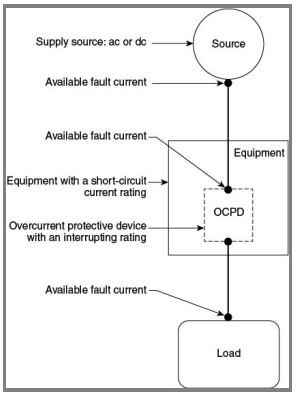
The current delivered at a point on the system during a short-circuit condition. (CMP-10)

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

The current reorganization of placing all definitions into article 100 will have a serious negative effect on usability of the NEC. This will have the most impact on specialty definitions that only apply to a single article becoming "lost" to the reader when located with all other definitions in article 100. I suggest that some improvement could be achieved by the creation of an informative annex (I used Annex K in my proposed informational note 2) listing such single-article definitions, sorted by article. In addition, the creation of hyperlinks in the electronic edition of the NEC where such defined terms appear in specific articles could provide an instant link to the definition in article 100. Both these solutions were discussed by various Code Panels during the First Revision meetings. Either or both of these changes would go a long way to restoring some of the usability lost by the move of definitions to article 100.

Related Item

• FR8213

Submitter Information Verification

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Submittal Date: Mon Jul 12 16:21:17 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: The suggested use of an annex is a duplication of Article 100 and would not enhance clarity. Further, it has not been substantiated that locating all definitions in Article 100 will have a negative effect on usability. Informative Annex K is already occupied with “Use of Medical Electrical Equipment in Dwellings and Residential Board-and-Care Occupancies.”

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)

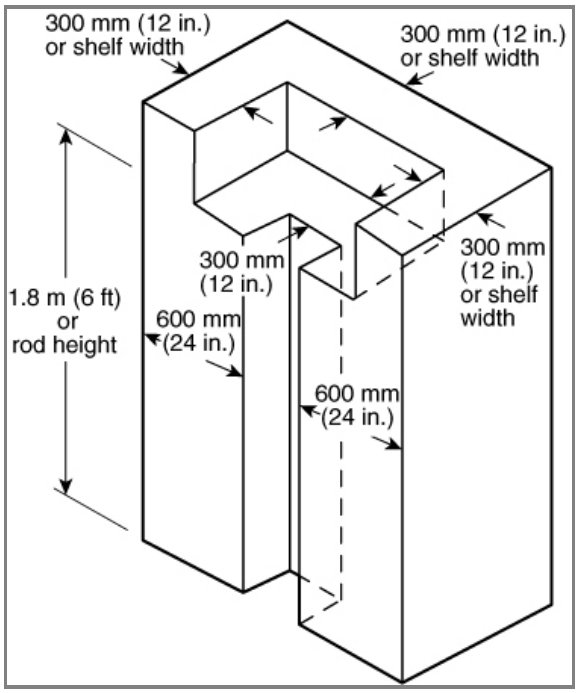
Clothes Closet.

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.

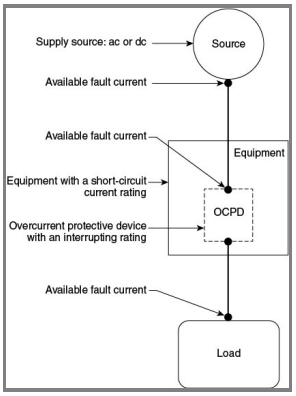
The current delivered at a point on the system during a short-circuit condition. (CMP-10)

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

Submitter Full Name: David Shapiro

Organization:	Safety First Electrical
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Mon Aug 02 22:01:23 EDT 2021
Committee:	NEC-P01

Committee Statement

Committee Action:	Rejected
Resolution:	The proposed definition could create correlation issues in other areas of the Code. A one-story home can be built wholly or partially below grade and qualify as a basement under the proposed defined term. The proposed definition would conflict with the definition in the NFPA 5000, International Building Code (IBC) and International Residential Code (IRC).

Public Comment No. 1254-NFPA 70-2021 [Definition:]

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 phrase "only as used in article XXX" 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*

Statement of Problem and Substantiation for Public Comment

Relocating all definitions to Article 100 is obviously a major change, and it needs to be well understood by anyone using the NEC. Simply referring to an article number parenthetically is not likely to help most people. Adding the term that I suggest would help casual users of the NEC understand how the definitions apply. Additionally, adding an informational note to the scope of each of article that has its own definitions, such as "See Article 100 for the definitions of XXX, YYY, and ZZZ" would be very welcome for most code users. We all know and agree that definitions are essential to proper application of the NEC, let's make sure this massive change goes as smoothly as possible.

Related Item

• FR 352

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Ryan Jackson
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 11 13:47:59 EDT 2021

Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: The Public Comment does not meet the requirements of Section 4.4.4 of Regulations Governing the Development of NFPA Standards.

Public Comment No. 1970-NFPA 70-2021 [Definition: Disconnecting Means.]

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)

Additional Proposed Changes

File Name	Description	Approved
CN_399.pdf	70_CN399	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 399 appeared in the First Draft Report.

The Correlating Committee notes that more than one related term is referenced in the definitions. Section 2.2.2.4 of the NEC Style Manual review this issue and the Correlating Committee establishes a Task Group with representation from Code-Making Panels 1, 7 and 12 to review the terms "Disconnecting Means", "Disconnecting Means, Parking Space" and "Disconnecting Means, Recreational Vehicle" to consider one definition for the term Disconnecting Means for correlation, if applicable. The definition Disconnecting Means is presently assigned to CMP-1. Each panel is assigned to revise the definitions under their purview to comply with the NEC Style Manual.

Related Item

• Correlating Note No. 399

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 18 20:53:18 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected
Resolution: CMP-1 reviewed the definition of "disconnecting means" and concluded that it is technically accurate, and the only definition needed throughout the Code.

Correlating Committee Note No. 399-NFPA 70-2021 [Definition: Disconnecting Means.]

Submitter Information Verification

Committee: NEC-AAC
Submittal Date: Fri May 07 16:56:33 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee notes that more than one related term is referenced in the definitions. Section 2.2.2.4 of the NEC Style Manual review this issue and the Correlating Committee establishes a Task Group with representation from Code-Making Panels 1, 7 and 12 to review the terms "Disconnecting Means", "Disconnecting Means, Parking Space" and "Disconnecting Means, Recreational Vehicle" to consider one definition for the term Disconnecting Means for correlation, if applicable. The definition Disconnecting Means is presently assigned to CMP-1. Each panel is assigned to revise the definitions under their purview to comply with the NEC Style Manual.

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. 1266-NFPA 70-2021 [Definition: Identified (as applied to equipment).]

Identified (as applied to equipment).

~~Recognizable as suitable~~ Designed and manufactured 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.

Statement of Problem and Substantiation for Public Comment

The current definition has no value whatsoever, because it does not indicate who the party is that determines that a product is "recognizable as suitable." If it is the AHJ, then this is no different than "approved." If it is a certifying body, it is not much different than "listed."

Related Item

• PI 565

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Ryan Jackson
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 11 14:40:43 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected
Resolution: Recognized as suitable, where described in a particular Code requirement provides sufficient clarity and direction for installers and enforcement to apply the Code.

Public Comment No. 647-NFPA 70-2021 [Definition: Identified (as applied to equipment).]

Identified (as applied to equipment).

Recognizable, on some basis beyond the manufacturer's declaration, 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.

Statement of Problem and Substantiation for Public Comment

1938 (definition): CMP response to PI 565 takes Mr. LeBlanc's terms "manufacturer instructions and specifications" as meaning the same thing as "self-declaration," and notes that this does not equate to the methods of identification specified in the I.N. His P.I. suggests that there are well-respected members of the electrical community who presumed that manufacturers' instructions and specs are sufficient identification. This is the reason to assert positively that the intention of "Identified" can not rest solely on self-declaration. The list of examples in the I.N. is not meant to be all-inclusive and does not claim to do so any more than other lists of examples found in NFPA codes. I believe it is worthwhile to explicitly acknowledge the intention excludes this means of identification.

Related Item

• IN 1938

Submitter Information Verification

Submitter Full Name: David Shapiro
Organization: Safety First Electrical
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 02 20:56:03 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: The proposed phrase "on some basis beyond the manufacturer's declaration" is too broad and may create confusion. Examples for application of the definition are provided in the informational note.

Public Comment No. 16-NFPA 70-2021 [Definition: In Sight From (Within Sight From, Within Sight).]

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)~~

Statement of Problem and Substantiation for Public Comment

This public comment does not modify the definition of In Sight From in any way. Rather, it recognizes it as a general requirement and moves it to Article 110, as seen in a companion public comment. This is identical to PI 2837, resolved by Panel 1 with the statement, "This term is used throughout the Code and thus belongs in Article 100 definitions."

None would dispute that the term is used throughout the Code; however, that in itself does not make it a definition. There are two choices: a definition in Article 100, or a general requirement in Article 110. We maintain that, as written, it is a general requirement. Examples of general requirements that multiple Code sections include 110.21(A) for reconditioned equipment, 110.21(B) general requirements for caution, warning, or danger signs and labels, and 110.25, the general requirements for lockable disconnecting means. Note that 110.21(B) says, "where ... required ... in this Code," and 110.25 says, "if ... required elsewhere in this Code." These sections are identical in their effect to the first part of the existing definition, to wit: "Where this Code specifies that ...".

As written, the existing definition of In Sight From cannot stand as a definition. It is a clear violation of NEC Style Manual rule 2.2.2, "Definitions shall not contain requirements or recommendations." In addition to the general rule-style of the first few words, there are requirements for distance (15 m) and visibility. The Scope statement of the NEC Style Manual (1.2) says it contains editorial and administrative requirements for writing NFPA 70 and NFPA 70E. Adherence to the Style Manual is not optional. That is the reason the NEC Correlating Commitee issued CN-404, directing CMP-1 to revise the definition to comply with the Manual of Style.

This submitter is issuing an additional public comment to add to Article 110 the exact language here proposed to be deleted from Article 100. Neither comment is valid without the other.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 18-NFPA 70-2021 [New Section after 110.16(B)]	

Related Item

- PI-2837

Submitter Information Verification

Submitter Full Name: William Fiske
Organization: Intertek Testing Services
Affiliation: N/A
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jun 29 13:07:29 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action:	Rejected
Resolution:	The definition is appropriately located in Article 100 and has been revised by a second revision.

Public Comment No. 1971-NFPA 70-2021 [Definition: In Sight From (Within Sight From, Within Sight).]

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)

Additional Proposed Changes

File Name	Description	Approved
CN_404.pdf	70_CN404	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 404 appeared in the First Draft Report.

The Correlating Committee directs that this definition be revised to comply with the NEC Style Manual. Section 2.2.2.2 states that definitions shall not contain requirements or recommendations.

Related Item

• Correlating Note No. 404

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 18 20:55:32 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7603-NFPA 70-2021
Statement: The definition was revised to comply with the NEC Style Manual. Section 2.2.2.2.

Correlating Committee Note No. 404-NFPA 70-2021 [Definition: In Sight From (Within Sight From, Within Sight).]

Submitter Information Verification

Committee: NEC-AAC
Submittal Date: Fri May 07 17:17:58 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs that this definition be revised to comply with the NEC Style Manual. Section 2.2.2.2 states that definitions shall not contain requirements or recommendations.

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 was premature in what is essentially overturning a resolve action on a Public Input that Panel 1 took. Panel 1 carefully considered the recommendation and associated substantiation as it contained an assertion similar to the following Corelating Committee committee statement: "The Correlating Committee directs that this definition be revised to comply with the NEC Style Manual. Section 2.2.2.2 states that definitions shall not contain requirements or recommendations." Panel 1 determined that it contained neither a requirement nor a recommendation as it resolved the Public Input. The Correlating Committee offered nothing new in its committee statement on this action. Further, the Correlating Committee did not detail what it considered a violation of 2.2.2.2 of the NEC Style Manual. Accordingly, the Correlating Committee should have refrained from weighing in on this issue until after Public Comments are submitted and processed and it conducts its Second Draft review and took whatever corrective action that a consensus of the Correlation Committee deemed necessary at that time. Directing Panel 1 to revise a definition that it already resolved without providing direction on what the Correlating Committee considered to be the word(s) or phrase(s) that needed to change and/or provide the recommended acceptable wording as it has on several other correlating notes in this report so that their concerns and suggested revisions to text could have public review is unfortunate.

Johnston, Michael J.

It appears that CMP-1 determined that the current and existing definition neither contained a requirement or a recommendation and it resolved the Public Input. The Correlating Committee is intervening in technical issues and offered nothing new in its committee statement on this action. Further, the Correlating Committee did not detail what it considered a violation of 2.2.2.2 of the NEC Style Manual. Accordingly, the Correlating Committee should have refrained from weighing in on this issue until after Public Comments are submitted and processed and it conducts its Second Draft review and took whatever corrective action that a consensus of the Correlation Committee deemed necessary at that time.

Public Comment No. 50-NFPA 70-2021 [Definition: In Sight From (Within Sight From, Within Sight).]

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~~ Equipment that is visible and not more than ~~15 m~~ 15 m (~~50 ft~~ 50 ft) distant from ~~the other. (CMP-1)~~ other equipment is in sight from that other equipment.

Statement of Problem and Substantiation for Public Comment

The existing definition contains both mandatory language and requirements. This proposed definition is in response to CMP-1's action to Resolve PI-2837, that proposed to move the definition to Article 110, and to Correlating Committee Note 404, that directs the panel to rewrite the definition so it does not contain requirements.
The comment removes the mandatory language (Where this Code specifies ...). It does not entirely eliminate all requirements, as the 15 m distance limit remains. We hold that there must be some reasonable limit on the distance or the definition would be meaningless. Absent some limit to the distance between objects, the moon would be in sight from Earth (often in daytime) according to the definition without it.
This submitter has issued PC-16 and PC-18, that are identical to original PI-2387 and PI-2389. If this public comment results in a Second Revision, even if "Reject but See," those Public Comments must be Rejected, as those comments and this one are mutually exclusive.

Related Item

• PI-2837 • Pi-2839 • CN-404

Submitter Information Verification

Submitter Full Name: William Fiske
Organization: Intertek Testing Services
Affiliation: N/A
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jun 30 15:24:13 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7603-NFPA 70-2021
Statement: The definition was revised to comply with the NEC Style Manual. Section 2.2.2.2.

Public Comment No. 649-NFPA 70-2021 [Definition: In Sight From (Within Sight From, Within Sight).]

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

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

Statement of Problem and Substantiation for Public Comment

Mr. Fiske has a valid point about style, but I do not believe it justifies removing the definition from Article 100. The issue of mandatory language can be resolved by changing a few words without altering the meaning, in order to make the definition pure description rather than prescription, as well as serving the concern addressed in PI 278. It did not occur to me that people might read "visible" as merely meaning that two pieces of equipment can both be seen from a third point. Nonetheless, if Inspector Sasso has had that experience in the field, it seems a simple solution will be to change the order of the terms slightly.

Related Item

• PI 3837 • PI 278

Submitter Information Verification

Submitter Full Name: David Shapiro
Organization: Safety First Electrical
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 02 21:06:44 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7603-NFPA 70-2021
Statement: The definition was revised to comply with the NEC Style Manual. Section 2.2.2.2.

Public Comment No. 1161-NFPA 70-2021 [Definition: Industrial Establishment [as applied to hazardo...]

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)

Additional Proposed Changes

File Name	Description	Approved
14_CN_402.pdf	14 CN402	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 402 appeared in the First Draft Report on First Revision No. 8748.

The Correlating Committee establishes a Task Group with representation from Panels 1, 1 O and 14 to review all current and proposed definitions and requirements related to the defined terms Supervised Industrial Installation and Industrial Establishment, including the overall use of the term in the document.

Each panel is assigned to revise the definitions under their purview to comply with the NEC Style Manual.

The Correlating Committee assigns the definition of Industrial Establishment to CMP-1

Related Item

• First Revision No. 8748

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 10 13:17:42 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7582-NFPA 70-2021
Statement: The term “industrial establishment” as used in the Code is well understood and does not need to be defined. The definition includes a requirement. The use of the term “industrial establishment” generally also includes conditions of maintenance and supervision ensure that only qualified persons service the installation.

Correlating Committee Note No. 402-NFPA 70-2021 [New Definition after Definition: Increased Safety “e”.]

Submitter Information Verification

Committee: NEC-P14
Submittal Date: Fri May 07 17:15:46 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee establishes a Task Group with representation from Panels 1, 10 and 14 to review all current and proposed definitions and requirements related to the defined terms Supervised Industrial Installation and Industrial Establishment, including the overall use of the term in the document.

Each panel is assigned to revise the definitions under their purview to comply with the NEC Style Manual.

The Correlating Committee assigns the definition of Industrial Establishment to CMP-1

First Revision No. 8748-NFPA 70-2021 [New Definition after Definition: Increased Safety “e”.]

Ballot Results

This item has passed ballot

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

Affirmative All

Ayer, Lawrence S.
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.

Affirmative with Comment

Gallo, Ernest J.
Title seems to have some errors New Definition after Definition: Increased Safety â??eâ??.

Public Comment No. 1527-NFPA 70-2021 [Definition: Industrial Establishment [as applied to hazardo...]

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~~ 1)

Statement of Problem and Substantiation for Public Comment

At the request of the correlating committee, a task group was formed from members Kevin Arnold (CMP-10), Mike Stone (CMP-1) and Don Ankele (CMP-14) to review definitions related to Industrial Installation and Industrial Establishment. The purpose of the task group was to review the definitions for accuracy, correlation, and style manual compliance. The removal of "(as applied to hazardous (classified) locations)" was removed as this definition will be under the purview of CMP-1 and applied throughout the NEC.

Related Item

• FR-8748

Submitter Information Verification

Submitter Full Name: Kevin Arnold
Organization: Eaton's Bussmann Business
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 16 10:47:34 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7582-NFPA 70-2021
Statement: The term "industrial establishment" as used in the Code is well understood and does not need to be defined. The definition includes a requirement. The use of the term "industrial establishment" generally also includes conditions of maintenance and supervision ensure that only qualified persons service the installation.

Public Comment No. 1953-NFPA 70-2021 [Definition: Industrial Establishment [as applied to hazardo...]

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~~ facility for production, manufacturing, transportation or storage with restricted public access, where the conditions of maintenance and ~~engineering~~ supervision ensure that only qualified persons ~~design, install, operate, and~~ service the installation. (CMP-14)

Statement of Problem and Substantiation for Public Comment

The originally proposed definition limits an “establishment” to a building or structure. It suggests an “industrial establishment” only exists within a building or structure. It also adds the AHJ approval requirement. This places additional restrictions, likely not intended with the original uses of the industrial exemption clause used throughout the NEC. The fact that an AHJ must approve the buildings or structures in the definition implies a requirement, which is not permitted in definitions. Also note that CMP1 resolved the proposed definition in PI2494 stating similar concerns related to limiting the definitions to buildings or structures and requiring AHJ approval.

Related Item

• FR-8748

Submitter Information Verification

Submitter Full Name: Louis Barrios
Organization: Shell Global Solutions
Affiliation: Shell
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 18 18:39:29 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7582-NFPA 70-2021
Statement: The term “industrial establishment” as used in the Code is well understood and does not need to be defined. The definition includes a requirement. The use of the term “industrial establishment” generally also includes conditions of maintenance and supervision ensure that only qualified persons service the installation.

Public Comment No. 2033-NFPA 70-2021 [Definition: Industrial Establishment [as applied to hazardo...]

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~~ persons design , install, operate, and service the installation. (CMP-14)

Informational Note: Documentation submitted to the AHJ for approval should include all details for the design of the electrical system and documentation for the qualified person(s) responsible for service and maintenance of the system.

Statement of Problem and Substantiation for Public Comment

The new Informational Note will assist the AHJ for required documents for approvals of the design and qualified person (S) that service these systems

Related Item

• FR8748

Submitter Information Verification

Submitter Full Name: Haywood Kines
Organization: Prince William County Building
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 19 08:47:04 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected
Resolution: The informational note is not needed with the deletion of the definition of industrial establishment.

Public Comment No. 2133-NFPA 70-2021 [Definition: Industrial Establishment [as applied to hazardo...]

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~~ facility for production, manufacturing, transportation or storage with restricted public access where the conditions of maintenance and engineering supervision ensure that only qualified ~~persons design, install, operate, and~~ persons service the installation. (CMP-14)

Statement of Problem and Substantiation for Public Comment

The new definition for Industrial Establishments does not seem to properly reflect an accurate definition for the use of this provision (both historically or functionally). Limiting to "buildings and structures" as well as adding the specific requirement for AHJ approval are significant changes to the intended use of this provision. The definition that I proposed by this comment is aligned with the existing text used throughout the Code.

Related Item

• FR-8748

Submitter Information Verification

Submitter Full Name: Phil Vinal
Organization: ExxonMobil
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 19 13:24:16 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7582-NFPA 70-2021
Statement: The term “industrial establishment” as used in the Code is well understood and does not need to be defined. The definition includes a requirement. The use of the term “industrial establishment” generally also includes conditions of maintenance and supervision ensure that only qualified persons service the installation.

Public Comment No. 2224-NFPA 70-2021 [Definition: Industrial Establishment [as applied to hazardo...]

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~~ facility for production, manufacturing, transportation or storage with restricted public access where the conditions of maintenance and engineering supervision ensure that only qualified ~~persons design, install, operate, and service~~ persons service the installation. (CMP-14)

Statement of Problem and Substantiation for Public Comment

The newly added definition for Industrial Establishments does not properly reflect an accurate definition for the use of this provision (both historically or functionally). Limiting to "buildings and structures" as well as a specific requirement for AHJ approval are significant changes to the intended use of this provision. The definition as proposed by this Comment is consistent with the existing text used extensively in the Code

Related Item

• FR-8748

Submitter Information Verification

Submitter Full Name: Dave Burns
Organization: Shell Projects & Technology
Affiliation: Shell
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 19 18:07:26 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7582-NFPA 70-2021
Statement: The term “industrial establishment” as used in the Code is well understood and does not need to be defined. The definition includes a requirement. The use of the term “industrial establishment” generally also includes conditions of maintenance and supervision ensure that only qualified persons service the installation.

Public Comment No. 313-NFPA 70-2021 [Definition: Industrial Establishment [as applied to hazardo...]

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~~ facility for production, manufacturing, transportation or storage with restricted public access where the conditions of maintenance and engineering supervision ensure that only qualified persons ~~design, install, operate, and~~ service the installation. (CMP-14)

Statement of Problem and Substantiation for Public Comment

The newly added definition for Industrial Establishments does not properly reflect an accurate definition for the use of this provision (both historically or functionally). Limiting to "buildings and structures" as well as a specific requirement for AHJ approval are significant changes to the intended use of this provision. The definition as proposed by this Comment is consistent with the existing text used extensively in the Code.

Related Item

• FR-8748

Submitter Information Verification

Submitter Full Name: Mark Goodman
Organization: Mark Goodman Electrical Consul
Affiliation: American Petroleum Institute
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jul 20 16:44:45 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7582-NFPA 70-2021
Statement: The term “industrial establishment” as used in the Code is well understood and does not need to be defined. The definition includes a requirement. The use of the term “industrial establishment” generally also includes conditions of maintenance and supervision ensure that only qualified persons service the installation.

Public Comment No. 653-NFPA 70-2021 [Definition: Industrial Establishment [as applied to hazardo...]

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

A ~~building(s) or structure(s)~~ location 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)

Statement of Problem and Substantiation for Public Comment

This change would seem to satisfy the CMP's critique of the PI.

Related Item

• 2494

Submitter Information Verification

Submitter Full Name: David Shapiro
Organization: Safety First Electrical
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 03 02:54:00 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7582-NFPA 70-2021
Statement: The term “industrial establishment” as used in the Code is well understood and does not need to be defined. The definition includes a requirement. The use of the term “industrial establishment” generally also includes conditions of maintenance and supervision ensure that only qualified persons service the installation.

Public Comment No. 766-NFPA 70-2021 [Definition: Industrial Establishment [as applied to hazardo...]

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)

Statement of Problem and Substantiation for Public Comment

This comment does not propose any changes to the new definition of industrial establishments. The term which is used throughout the hazardous location articles; sometimes being used several times is the same section. Not only can the text be construed as a definition in an Article other than Article 100 the repeated text does not add to the clarity of the code. Comments have been added to those sections of the hazardous locations articles that contain the term and deletes the unneeded language. These changes and the new definition will add clarity.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 95-NFPA 70-2021 [Section No. 501.10(A)(1)]	
Public Comment No. 96-NFPA 70-2021 [Section No. 501.10(A)(2)]	
Public Comment No. 335-NFPA 70-2021 [Section No. 501.10(B)]	
Public Comment No. 103-NFPA 70-2021 [Section No. 502.10(A)]	
Public Comment No. 105-NFPA 70-2021 [Section No. 502.10(B)]	
Public Comment No. 402-NFPA 70-2021 [Section No. 502.150(B)(5)]	
Public Comment No. 106-NFPA 70-2021 [Section No. 503.10(A)]	
Public Comment No. 338-NFPA 70-2021 [Section No. 505.15(B)]	
Public Comment No. 339-NFPA 70-2021 [Section No. 505.15(C)]	
Public Comment No. 790-NFPA 70-2021 [Section No. 505.17(A)]	
Public Comment No. 340-NFPA 70-2021 [Section No. 506.15]	
Public Comment No. 95-NFPA 70-2021 [Section No. 501.10(A)(1)]	
Public Comment No. 96-NFPA 70-2021 [Section No. 501.10(A)(2)]	
Public Comment No. 103-NFPA 70-2021 [Section No. 502.10(A)]	
Public Comment No. 105-NFPA 70-2021 [Section No. 502.10(B)]	
Public Comment No. 106-NFPA 70-2021 [Section No. 503.10(A)]	
Public Comment No. 335-NFPA 70-2021 [Section No. 501.10(B)]	
Public Comment No. 338-NFPA 70-2021 [Section No. 505.15(B)]	
Public Comment No. 339-NFPA 70-2021 [Section No. 505.15(C)]	
Public Comment No. 402-NFPA 70-2021 [Section No. 502.150(B)(5)]	
Public Comment No. 790-NFPA 70-2021 [Section No. 505.17(A)]	

Related Item

- FR-8748

Submitter Information Verification

Submitter Full Name: John Simmons
Organization: Florida East Coast Jatc

Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 04 09:58:57 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: The Public Comment does not meet the requirements of Section 4.4.4 of Regulations Governing the Development of NFPA Standards. The definition was removed by a second second revision. The Public Comments related to Chapter 5 are addressed by CMP-14.

Public Comment No. 650-NFPA 70-2021 [Definition: Location, Dry.]

Location, Dry.

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

Statement of Problem and Substantiation for Public Comment

Mr. Murphy points out an awkward problem, particularly for those who do not choose to cite 110.12. A situation somewhat parallel to his example is addressed by NEMA/UL guidance document on evaluating water-damaged electrical equipment. One possible resolution of this quandary would be to add the proposed wording.
In a building under construction, if for example a dry-location coil of cable or a loadcenter were subject to saturation or submersion, which means the water could penetrate inside–the result, for example for an enclosure of less than Class 6--could be as serious as if it had been installed outdoors.

Related Item

• PI 605

Submitter Information Verification

Submitter Full Name: David Shapiro
Organization: Safety First Electrical
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 02 21:13:27 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected
Resolution: Installations subject to saturation are defined as wet locations. Immersion by default leads to saturation.

Public Comment No. 1706-NFPA 70-2021 [Definition: Occupiable Space.]

Occupiable Space.

A room or enclosed space designed for human occupancy in which individuals congregate for amusement, educational or similar purposes or in which occupants are engaged for labor, and which is equipped with means of egress and light and ventilation facilities . (CMP-1)

Statement of Problem and Substantiation for Public Comment

The definition as worded needs to reflect current building code practice. This term is crucial to the application of 404.2(C). I am also filing a comment (PC-1710) linked to this one that would remove the phrasing "as defined in the applicable building code" because it would no longer be necessary. It makes the commercial and related applications of the requirement very clear and exactly as CMP 9 intended the rule to work.

Related Item

• FR-9576 • PC-1710

Submitter Information Verification

Submitter Full Name: Frederic Hartwell
Organization: Hartwell Electrical Services, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 17 13:34:17 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected
Resolution: Occupiable space is different and distinct from habitable space. The existing definition of occupiable space has been deleted by a second revision.

Public Comment No. 2229-NFPA 70-2021 [Definition: Occupiable Space.]

Occupiable Space.

A room or enclosed space designed for human occupancy. (CMP-1)

Additional Proposed Changes

File Name	Description	Approved
1_CN_405.pdf	70_CN405	

Statement of Problem and Substantiation for Public Comment

The following CC Note No. 405 appeared in the First Draft Report on First Revision No. 9576.

The Correlating Committee directs this definition be reconsidered for correlation. The term is used only in 404.2(C) which requires the user to use the applicable building code for the definition.

Related Item

• First Revision No. 9576

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 25 13:56:04 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: Occupiable space is different and distinct from habitable space. The existing definition of occupiable space has been deleted by a second revision.

Correlating Committee Note No. 405-NFPA 70-2021 [New Definition after Definition: Nonlinear Load.]

Submitter Information Verification

Committee: NEC-P01
Submittal Date: Fri May 07 17:18:49 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs this definition be reconsidered for correlation. The term is used only in 404.2(C) which requires the user to use the applicable building code for the definition.

First Revision No. 9576-NFPA 70-2021 [New Definition after Definition: Nonlinear Load.]

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. 651-NFPA 70-2021 [Definition: Occupiable Space.]

~~**Occupiable Space.**~~

~~A room or enclosed space designed for human occupancy. (CMP-1)~~

Statement of Problem and Substantiation for Public Comment

"Occupiable space" seems largely to equate in its functions with habitable space, a term defined in building codes, but differently than is offered in this PI. While these are not identical, the difference is small enough to be likely to cause confusion.

Related Item

• 4505

Submitter Information Verification

Submitter Full Name: David Shapiro
Organization: Safety First Electrical
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 02 21:54:09 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Accepted
Resolution: SR-7655-NFPA 70-2021
Statement: The definition for occupiable space that is used only one time in the Code is deleted.

Public Comment No. 1980-NFPA 70-2021 [Definition: Premises.]

Premises.

The land and buildings of a user located on the user side of the utility-user network point of demarcation. (800) (CMP-16)

Additional Proposed Changes

File Name	Description	Approved
CN_412.pdf	70_CN412	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 412 appeared in the First Draft Report.

The Correlating Committee establishes a Task Group between CMP-1 and CMP-16 to review the term premises and to consider a definition that can be used throughout the code rather than only in Article 800.

Related Item

• Correlating Note No. 412

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 18 21:21:32 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected
Resolution: There is no definition of “premises“ under the purview of CMP-1.

Correlating Committee Note No. 412-NFPA 70-2021 [Definition: Premises.]

Submitter Information Verification

Committee: NEC-AAC
Submittal Date: Sun May 09 21:44:57 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee establishes a Task Group between CMP-1 and CMP-16 to review the term premises and to consider a definition that can be used throughout the code rather than only in Article 800.

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. 1972-NFPA 70-2021 [Definition: Reconditioned.]

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*.

Additional Proposed Changes

File Name	Description	Approved
CN_406.pdf	70_CN406	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 406 appeared in the First Draft Report.

The Correlating Committee assigns the definition of "reconditioned" to CMP-1.

Related Item

• Correlating Note No. 406

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 18 20:57:13 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7745-NFPA 70-2021
Statement: The definition for “reconditioned” has been assigned to CMP-1.

Correlating Committee Note No. 406-NFPA 70-2021 [Definition: Reconditioned.]

Submitter Information Verification

Committee: NEC-AAC
Submittal Date: Fri May 07 17:19:39 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee assigns the definition of “reconditioned” to CMP-1.

Ballot Results

This item has passed ballot

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

Affirmative All

Ayer, Lawrence S.
Gallo, Ernest J.
Hickman, Palmer L.
Hunter, Dean C.
Johnston, Michael J.
Kendall, David H.
Kovacik, John R.
Manche, Alan
McDaniel, Roger D.
Porter, Christine T.
Williams, David A.

Affirmative with Comment

Holub, Richard A.

The definition either needs to be revised to make it clear that ordinary motor repair is not considered reconditioning or Article 430 should make this clear. The reconditioning language, in my opinion, is out of scope for the NEC to begin with but it's particularly troubling of motor rewinding is considered "reconditioning" by an AHJ as the approval marks are removed from reconditioned equipment.

Public Comment No. 858-NFPA 70-2021 [Definition: Reconditioned.]

Reconditioned.

Electromechanical systems, equipment, apparatus, or components that are restored to operating conditions. This process differs from ~~normal~~ routine servicing ~~of equipment that remains within~~ , maintenance or repair of systems, equipment, or materials that remain within a facility, or replacement of listed equipment on a one-to-one basis. Routine servicing or maintenance typically involves no change in ownership of the material in question where as reconditioned equipment typically is typically sold and the ability to verify what changes were made to the equipment may be lost with the change in ownership. (CMP-10)

Informational Note: The term *reconditioned* is frequently referred to as *rebuilt*, *refurbished*, or *remanufactured*.

Statement of Problem and Substantiation for Public Comment

The problem with the current definition is that a repair or rewind of a motor, which has been done safely for decades, may not be disallowed and a repaired motor may not be able to be installed if the listing marks are removed from the motor. There has been no justification to mandate such and the current ambiguity around the definition has resulted in CMP 11 being silent on the reconditioning of motors, to date. The current definition uses the language " remains installed within a facility" but that really isn't well understood or defined in any manner. A motor may be repaired in place, such as changing the bearings, or it could be pulled from service and repaired at a qualified repair facility. The motor repair shops reverse engineer the windings and restore the motors to operating condition, including testing them for function, and this process should continue without the impediment of this ambiguous NEC(r) definition.

Related Item

• Public Input No. 1790

Submitter Information Verification

Submitter Full Name: Richard Holub
Organization: The DuPont Company, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 04 14:49:22 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: The current definition does not require removal of a label or prohibit the normal servicing of equipment within a facility. The proposed revision does not add clarity to the definition.

Public Comment No. 1941-NFPA 70-2021 [Definition: Servicing.]

Servicing.

The process of following a manufacturer's set of instructions or acceptable industry standards 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.

Statement of Problem and Substantiation for Public Comment

New definition for "Servicing" implies that activities intended to preserve or restore operation performance are only considered "servicing" when manufacturer's instructions are used, and does not recognize the use of acceptable industry standards for maintenance such as NFPA 70B, or other industry consensus standards for equipment design and refurbishment.

Related Item

• FR-8449

Submitter Information Verification

Submitter Full Name: Louis Barrios
Organization: Shell Global Solutions
Affiliation: American Chemistry Council
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 18 17:28:38 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7743-NFPA 70-2021
Statement: Industry standards such as NFPA 70B may be used a guide for servicing of equipment and therefore the definition is amended to include applicable industry standards in addition to manufacturer’s instructions.

Public Comment No. 549-NFPA 70-2021 [Definition: Voltage, Nominal.]

Voltage, Nominal (Nominal Voltage) .

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).*

Statement of Problem and Substantiation for Public Comment

Definitions Task Group 7, as directed by the Correlating Committee, has reviewed the multiple definitions of "Nominal Voltage" that were presented in the First Draft Report. The task group recommends retaining the global definition assigned to CMP-1 and deleting the definition assigned to CMP-13 (Article 712). This action resolves the multiple definitions issue with no alteration of the defined term or of its applicability or usage in the document. The addition of the searchable term “Nominal Voltage” was added to comply with Section 2.2.2.3.1 of the NEC Style Manual.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 550-NFPA 70-2021 [Definition: Voltage, Nominal. (Nominal Voltage)]	
Public Comment No. 550-NFPA 70-2021 [Definition: Voltage, Nominal. (Nominal Voltage)]	

Related Item

- FR 8462

Submitter Information Verification

Submitter Full Name: Chad Kennedy
Organization: Schneider Electric
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jul 30 08:03:51 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7702-NFPA 70-2021
Statement: The searchable term “Nominal Voltage” was added in the title to comply with the NEC Style Manual.

Public Comment No. 654-NFPA 70-2021 [Definitions (100): Photovoltai... to Pier....]

Definitions (100): Photovoltai... to Pier....

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)

Physical Damage

Damage that may adversely affect safe operation or mechanical strength of the equipment or that obscures necessary markings.

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)

Statement of Problem and Substantiation for Public Comment

Mr. Torrisi's proposed definition makes clear what kind of physical damage is of concern to the NEC. It does not remove the evaluation/determination of such damage from the AHJ.

Related Item

• PI 160

Submitter Information Verification

Submitter Full Name: David Shapiro
Organization: Safety First Electrical
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 03 02:59:50 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: Adequate substantiation has not been provided that an AHJ is unable to determine potential damage based on a field condition. There are numerous physical protection installation rules in the Code that the AHJ can use to determine whether physical damage may occur.

Public Comment No. 836-NFPA 70-2021 [New Definition after Definition: Photovoltaic (PV) System.]

TITLE OF NEW CONTENT

Physical Damage

Damage that may adversely affect safe operation or mechanical strength of the equipment

Statement of Problem and Substantiation for Public Comment

The CMP resolution statement "This is a determination most appropriately made by the AHJ based on specific conditions." supports the requirement for the definition.
The new definition outlines what the expectation or extent of the damage that will occur, in ORDER for the AHJ may make the determination, based on the specific circumstances. The extent of damage needs to be defined to inform the AHJ a certain level of damage is unacceptable. Would it be safe to say that if no physical damage, that will compromise or lead to compromise the integrity of the system SHALL NOT be required to be protected from Physical damage, then conversely it should be ok to say it is required when it meets the PD definition. The old if I can touch it then it's subject to PD needs to go.

Related Item

- PI 160

Submitter Information Verification

Submitter Full Name: Alfio Torrisi
Organization: master electrical
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 04 13:38:08 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: Adequate substantiation has not been provided that an AHJ is unable to determine potential damage based on a field condition. There are numerous physical protection installation rules in the Code that the AHJ can use to determine whether physical damage may occur.

Public Comment No. 2143-NFPA 70-2021 [Section No. 110.3(A)]

(A) Examination.

In judging equipment, considerations such as the following shall be evaluated:

(1) Suitability for installation and use in conformity with this *Code*

Informational Note No. 1: Equipment may be new, reconditioned, refurbished, or remanufactured.

Informational Note No. 2: Suitability of equipment use may be identified by a description marked on or provided with a product to identify the suitability of the product for a specific purpose, environment, or application. Special conditions of use or other limitations and other pertinent information may be marked on the equipment, included in the product instructions, or included in the appropriate listing and labeling information. Suitability of equipment may be evidenced by listing or labeling.

(2) Mechanical strength and durability, including, for parts designed to enclose and protect other equipment, the adequacy of the protection thus provided

(3) Wire-bending and connection space

(4) Electrical insulation

(5) Heating effects under normal conditions of use and also under abnormal conditions likely to arise in service

(6) Arcing effects

(7) Classification by type, size, voltage, current capacity, and specific use

(8) Cybersecurity for network-connected life-safety equipment, to address its ability to withstand unauthorized updates and malicious attacks while continuing to perform its intended safety functionality.

Informational Note No. 3: The IEC 62443 series of standards for Industrial Automation and Control Systems, the UL 2900 series of standards for Software Cybersecurity for Network-Connectable Products, and UL 5500 the Standard for Remote Software Updates, are standards that provide frameworks to mitigate current and future security cybersecurity vulnerabilities and address software integrity in systems of electrical equipment.

(1) Other factors that contribute to the practical safeguarding of persons using or likely to come in contact with the equipment

Statement of Problem and Substantiation for Public Comment

Smart, connected devices are becoming widespread as the Internet of Things (IoT) grows at a rapid rate, especially with regard to industrial equipment and equipment performing protective or life-safety functions such as circuit breakers. Along with this technology comes the increased threat of cyberattacks. These attacks cost millions of dollars, and the frequency of these attacks are increasing. These attacks can impair the ability of life-safety equipment and critical systems to operate in their essential roles. The purpose of the NEC is practical safeguarding from the hazards arising from the use of electricity, and addressing the risks of cyberattacks on life-safety equipment in our increasingly connected electrical infrastructure is necessary and appropriate. Cybersecurity for these types of devices should be implemented to ensure all critical system safety quality attributes, such as integrity and availability, are maintained. The concern addressed by this proposal is focused on the safety related security of these devices, and not issues of privacy or data protection.

It should be noted that two Code Making Panels (Panel 10 and Panel 13) recognized this as a safety concern and added requirements in Sections 240.6(D) and 708.7 to address cybersecurity. While this is a good first step, cyber attacks, and the equipment that is susceptible to these attacks, are evolving quickly. The Code and the public it protects can't wait every 3 years to play catch-up with the next threat to emerge. A statement, like the one proposed, does not mandate a cybersecurity evaluation, but acknowledges it as a

hazard and adds it to the list of "considerations" when judging equipment.

It should also be noted that while the phrase “other factors” (list Item (8) in the present Code) may be applied broadly to all hazards, cybersecurity is a specific hazard that is becoming more prevalent today. For this reason, it should be identified as a specific consideration when evaluating equipment for safety.

Lastly, in a separate Public Input, PI-3055, a more prescriptive approach was presented. This Public Comment suggests a more general approach by acknowledging this as a consideration in the list of hazards in 110.3(A).

Note: The text for 110.3(A), generated by TerraView, incorrectly renumbers existing list item (8) to list item (1), and shows it as new text. The intent of this Public Comment is to add the new list item as item (8), renumbering the last item in the list to item (9).

Related Item

• PI 4024 • PI 3055 • FR 7947 • FR 8914

Submitter Information Verification

Submitter Full Name: Robert Osborne
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 19 13:49:52 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7666-NFPA 70-2021
Statement: Although a part of one existing requirement states that “other factors” should be evaluated as part of the required examination in judging equipment, a “cybersecurity for network-connected life-safety equipment, to address its ability to withstand unauthorized updates and malicious attacks while continuing to perform its intended safety functionality,” is justified as being specifically referenced as being required by the examination requirements of 110.3(A). See NFPA 101: Life Safety Code for examples of life safety equipment.

Public Comment No. 348-NFPA 70-2021 [Section No. 110.3(A)]

(A) Examination.

In judging equipment, considerations such as the following shall be evaluated:

(1) Suitability for installation and use in conformity with this *Code*

Informational Note No. 1: Equipment may be new, reconditioned, refurbished, or remanufactured.

Informational Note No. 2: Suitability of equipment use may be identified by a description marked on or provided with a product to identify the suitability of the product for a specific purpose, environment, or application. Special conditions of use or other limitations and other pertinent information may be marked on the equipment, included in the product instructions, or included in the appropriate listing and labeling information. Suitability of equipment may be evidenced by listing or labeling.

(2) Mechanical strength and durability, including, for parts designed to enclose and protect other equipment, the adequacy of the protection thus provided

(3) Wire-bending and connection space

(4) Electrical insulation

(5) Heating effects under normal conditions of use and also under abnormal conditions likely to arise in service

(6) Arcing effects

(7) Classification by type, size, voltage, current capacity, and specific use

(8) Cybersecurity and cyberweapon protection

(9) Other factors that contribute to the practical safeguarding of persons using or likely to come in contact with the equipment

Statement of Problem and Substantiation for Public Comment

PI 4024 provided great substantiation for the need to protect critical infrastructure against cyber attack for equipment connected to the internet. However, equipment does not need to be connected to the internet in order to be damaged or destroyed by cyber threats. Equipment can be damaged by cyber weapons such as malicious computer worms that attack SCADA systems. A great example is the Stuxnet worm that destroyed the centrifuges in Iran. Thus, this Public Comment deletes the reference to the internet and adds cyberweapon to the list of considerations that need to be evaluated.

While recent well-publicized events emphasize the need to protect critical infrastructure against cyber threats, it doesn't appear that the NEC(R) is ready to actually require cyber protection at this time, Recognizing this hesitancy, this Public Comment does not require cyber protection, but will simply bring cyber protection to the discussion table. Maybe the 2026 NEC(R) will include actual requirements for cyber protection? If it's not too late?

Related Item

• PI 4024

Submitter Information Verification

Submitter Full Name: Vincent Saporita
Organization: Saporita Consulting
Affiliation: Saporita Consulting
Street Address:

City:
State:
Zip:
Submittal Date: Sat Jul 24 12:19:43 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-7666-NFPA 70-2021

Statement: Although a part of one existing requirement states that “other factors” should be evaluated as part of the required examination in judging equipment, a “cybersecurity for network-connected life-safety equipment, to address its ability to withstand unauthorized updates and malicious attacks while continuing to perform its intended safety functionality,” is justified as being specifically referenced as being required by the examination requirements of 110.3(A). See NFPA 101: Life Safety Code for examples of life safety equipment.

Public Comment No. 349-NFPA 70-2021 [Section No. 110.3(A)]

(A) Examination.

In judging equipment, considerations such as the following shall be evaluated:

(1) Suitability for installation and use in conformity with this *Code*

Informational Note No. 1: Equipment may be new, reconditioned, refurbished, or remanufactured.

Informational Note No. 2: Suitability of equipment use may be identified by a description marked on or provided with a product to identify the suitability of the product for a specific purpose, environment, or application. Special conditions of use or other limitations and other pertinent information may be marked on the equipment, included in the product instructions, or included in the appropriate listing and labeling information. Suitability of equipment may be evidenced by listing or labeling.

(2) Mechanical strength and durability, including, for parts designed to enclose and protect other equipment, the adequacy of the protection thus provided

(3) Wire-bending and connection space

(4) Electrical insulation

(5) Heating effects under normal conditions of use and also under abnormal conditions likely to arise in service

(6) Arcing effects

(7) Classification by type, size, voltage, current capacity, and specific use

(8) Electromagnetic Pulse (EMP), Geomagnetic Disturbance (GMD), and Intentional Electromagnetic Interference (IEMI) protection

(9) Other factors that contribute to the practical safeguarding of persons using or likely to come in contact with the equipment

Statement of Problem and Substantiation for Public Comment

PI 761 provided technical substantiation to require Electromagnetic Pulse (EMP) Protection for our critical infrastructure. While it appears that the NEC(R) is not ready to actually require EMP protection at this time, the security of our country is at stake. This Public Comment will at least bring the subject to the discussion table. It does not require EMP protection, but simply adds it to the list of considerations.

An EMP is fairly well understood as an extremely powerful wave that can impress 50,000 volts per meter on every piece of electrical equipment, destroying everything that is unprotected. An EMP is often associated with a nuclear explosion, but that is not the only cause of damage. A Geomagnetic Disturbance (GMD) is caused by a sunspot. While the EMP would be created by one of our adversaries, the sun spot is an act of God. These types of events can instantly initiate millions of fires in our unprotected electrical systems, overwhelming our fire-fighting capabilities. If millions of fires weren't bad enough, the unprotected electrical equipment would be damaged or completely destroyed, subjecting the country to years of blackout. Government studies have predicted that from 66% to 90% of our population would die within one year due to a lack of food, clean water, and medicine if a significant EMP or GMD were to occur.

The final consideration listed is an Intentional Electromagnetic Interference (IEMI). It is easily created by utilizing off-the-shelf parts, available for purchase on the internet, that will fit into a van. While much less powerful than a a significant EMP or GMD, twenty vans scattered throughout the country can shut down major industries and major parts of the country for weeks, if not months, through a coordinated attack, similar to 9/11, by targeting key industries/vulnerabilities.

In conclusion, these threats to our unprotected electrical infrastructure, and therefor to our entire country are absolutely real, and need to be addressed.

Related Item

• PI 761

Submitter Information Verification

Submitter Full Name: Vincent Saporita
Organization: Saporita Consulting
Affiliation: Saporita Consulting
Street Address:
City:
State:
Zip:
Submittal Date: Sat Jul 24 12:53:25 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: This is a very broad subject which covers such things as nuclear attacks and geomagnetic storms. This is not within the Scope of the NEC.

Public Comment No. 1040-NFPA 70-2021 [Section No. 110.3(B)]

(B) Installation and Use.

Equipment that is listed, labeled, or both, or identified for a use shall be installed and used in accordance with any instructions included in the listing, labeling, or ~~labeling~~ identification .

Informational Note: The installation and use instructions may be provided in the form of printed material, quick response (QR) code, or the address on the internet where users can download the required instructions.

Statement of Problem and Substantiation for Public Comment

Misuse is not limited to listed products. For instance, 314.21's requirement for repair of openings for switch boxes may be performed using caulk identified but not listed for the purpose. However, different caulks are identified as suitable for filling cracks of different widths. Ignore that identification, and the opening may reappear. Broadening this requirement won't eliminate all such problems, but in this example it will give an inspector a basis for saying "Let me see that tube; looks like you caulked a pretty wide opening here" without falling back on 110.12.

Related Item

• PI4619

Submitter Information Verification

Submitter Full Name: David Shapiro
Organization: Safety First Electrical
Street Address:
City:
State:
Zip:
Submittal Date: Fri Aug 06 01:36:42 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7668-NFPA 70-2021
Statement: Not all equipment is listed or labeled and that installation instructions, if provided, should be used. See the definition of Identified (as applicable to equipment) in Article 100. The new informational note addresses any conflict that might exist in the installation or use instructions which should not circumvent Code requirements.

Public Comment No. 1283-NFPA 70-2021 [Section No. 110.3(B)]

(B) Installation and Use.

Equipment that is listed, labeled, or both shall be installed and used in accordance with any instructions included in the listing or labeling.

~~Informational Note: The installation and use instructions may be provided in the form of printed material, quick response (QR) code, or the address on the internet where users can download the required instructions.~~

Statement of Problem and Substantiation for Public Comment

Are there really people in the world that don't already know this?

Related Item

• FR 8487

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Ryan Jackson
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 11 15:42:15 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: The Informational Note details the way that installation instructions can be provided. Certain listed products allow electronic means such as a QR Code, or URL address, others do not. It is helpful to the Code user to know that other methods may be available other than printed material.

Public Comment No. 1533-NFPA 70-2021 [Section No. 110.3(B)]

(B) Installation and Use.

Equipment that is listed, labeled, or both shall be installed and used in accordance with any instructions included in the listing or labeling.

Informational Note No 1 : The installation and use instructions may be provided in the form of printed material, quick response (QR) code, or the address on the internet where users can download the required instructions.

Informational Note No.2: The installation and use instructions may not reduce the requirements in the Code.

Statement of Problem and Substantiation for Public Comment

Links to examples of installation instructions are provided below that either specify that appliances are not to be supplied by GFCI protected outlets or suggest that GFCI protection should not be used, even in cases where the appliance is intended for outdoor use. The purpose of this proposal is to clarify that when installation instructions and requirements of the NEC are in conflict, the requirements of the NEC should prevail and supersede the installation instructions. Without this clarification, manufactures' instructions could be used as a way to circumvent important safety requirements that are present in the NEC.

GFCI not allowed:

- https://www.dacor.com/uploads/Dacor/93/931e4f95-bda1-4491-8c30-24c264a5af00.pdf
- https://www.dacor.com/uploads/Dacor/79/7963425c-ef60-41a3-9557-5a3e64a0525a.pdf
- https://content.abt.com/documents/72030/AMLFDR23BK_specs.pdf
- http://documents.designerappliances.com/Specifications-DTF364SIWS.pdf

Outdoor refrigerator, GFCI not recommended:

- https://content.abt.com/documents/23169/of24rs_install.pdf
- https://static.appliancesconnection.com/attachments/D5695a7dfcc825.pdf
- https://cdn.shocho.co/sc-specsheets/10-1-MO15CRS1XS%20-%20Owners%20Manual.pdf?_ga=2.102743745.1154791752.1614972369-836954612.1614972369&_gac=1.11731456.1614973175.EAIaIQobChMI8Juz7_OZ7wIVQ7KGCh26-QTdEAAYASAAEgLfovD_BwE

GFCI not recommended:

- https://www.subzero-wolf.com/-/media/files/united-states/product-downloads/discontinued-products/sub-zero/600-series/600-series-ig.pdf
- https://www.subzero-wolf.com/-/media/files/united-states/product-downloads/sub-zero-wolf/installation-guides/sub-zero/deundercounter_ig.pdf
- https://www.subzero-wolf.com/-/media/files/united-states/product-downloads/sub-zero-wolf/installation-guides/sub-zero/uc-15i-install.pdf
- http://cdn.techandhouse.com/FPGU19F8TF/CompleteOwnersGuide.pdf
- https://www.scotsman-ice.com/uploadedfiles/residential/Downloads/Refrigerator/Owner_Manuals/Owners%20Manual%20SCR.pdf

Related Item

• FR 8487

Submitter Information Verification

Submitter Full Name: Megan Hayes
Organization: Nema
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 16 11:39:39 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-7668-NFPA 70-2021

Statement: Not all equipment is listed or labeled and that installation instructions, if provided, should be used. See the definition of Identified (as applicable to equipment) in Article 100. The new informational note addresses any conflict that might exist in the installation or use instructions which should not circumvent Code requirements.

Public Comment No. 2181-NFPA 70-2021 [Section No. 110.3(C)]

(C) Listing.

Listed equipment shall have a certification or listing mark on the equipment or the smallest shipping container for the equipment. The listing or certification mark shall be applied only at the point of manufacture. Product testing, evaluation, and listing (product certification) shall be performed by recognized qualified electrical testing laboratories and shall be in accordance with applicable product standards recognized as achieving equivalent and effective safety for equipment installed to comply with this *Code*.

Informational Note: The Occupational Safety and Health Administration (OSHA) recognizes qualified electrical testing laboratories that perform evaluations, testing, and certification of certain products to ensure that they meet the requirements of both the construction and general industry OSHA electrical standards. If the listing (product certification) is done under a qualified electrical testing laboratory program, this listing mark signifies that the tested and certified product complies with the requirements of one or more ~~appropriate product safety test standards.~~ appropriate

Statement of Problem and Substantiation for Public Comment

When I submitted this language as a public input, the response from CMP 1 was: "products that are listed or certified to a standard already include a label or mark on the product or the smallest product container by the manufacturer. CMP-1 concludes that this action adequately addresses the issue." I couldn't agree more with the first sentence. It doesn't explain why so many panels keep requiring that equipment be "listed and labeled." That requires that products meet both of these definitions:

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.

AND

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.

If the panel statement is true, requiring both listed and labeled equipment is the department of redundancy department. During the 2020 cycle, CMP 1 revised the beginning of 110.3(B) as follows:

"Equipment that is listed, labeled, OR BOTH shall be installed and used in accordance with any instructions included in the listing or labeling."

Rather than continuing the proliferation of "listed and labeled" throughout the code and this recognition that doing both listing and labeling is different than just requiring that products be listed, I recommend incorporating this language to discourage this practice.

Related Item

• PI 1586

Submitter Information Verification

Submitter Full Name: Mark Earley
Organization: Alumni Code Consulting
Affiliation: Self

Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 19 15:58:29 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: The terms “listed” and “labeled” are well understood by Code users. Some organizations do not recognize equipment as listed unless it is also labeled. CMP-1 reaffirms its conclusion from the First Draft meeting that the current wording adequately addresses the issue. The proposed change in the Informational Note is unclear and not a complete sentence. There are programs that exist where the label can be applied in the field.

Public Comment No. 655-NFPA 70-2021 [Section No. 110.4]

110.4 Voltages.

~~Throughout this~~ ~~*Code*~~ ~~, the~~ The voltage considered shall be that at which the circuit operates. The voltage rating of electrical equipment shall not be less than the nominal voltage of a circuit to which it is connected.

Statement of Problem and Substantiation for Public Comment

The CMP has not stated that this verbiage serves any purpose. This is especially true given the addition of "General" to the title of Article 110.

Related Item

• 1394

Submitter Information Verification

Submitter Full Name: David Shapiro
Organization: Safety First Electrical
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 03 03:04:07 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Accepted
Resolution: SR-7671-NFPA 70-2021
Statement: The phrase "throughout this Code" is unnecessary.

Public Comment No. 29-NFPA 70-2021 [Section No. 110.5]

110.5 Conductors.

Conductors used to carry current shall be of copper, aluminum, or copper-clad aluminum unless otherwise provided in this *Code*. ~~Where the~~ If the conductor material is not specified, the sizes given in this *Code* shall apply to copper conductors. ~~Where other~~ If other materials are used, the size shall be changed accordingly.

Statement of Problem and Substantiation for Public Comment

This Comment is intended to bring this section into compliance with the NEC Style Manual. "If" is to be used to indicate a condition and "where" a location.

Related Item

• PI-3327

Submitter Information Verification

Submitter Full Name: Phil Simmons
Organization: Simmons Electrical Services
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jun 29 21:06:09 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7672-NFPA 70-2021
Statement: The modifications align with the NEC Style Manual; using the term “if” when stating a condition rather than a location is appropriate in this section.

Public Comment No. 656-NFPA 70-2021 [Section No. 110.7]

110.7 Wiring Integrity.

~~Completed wiring~~ (A)Wiring installations shall be free from short circuits, ground faults, or any connections to ground other than as required or permitted elsewhere in this *Code*.

(B) Incomplete and Abandoned Work

Incomplete or abandoned work in the immediate vicinity of new electric work shall be permitted to remain only if all ungrounded and grounded conductors are terminated in a manner that the installation will be free from electrical faults if any of

these conductors is energized.

Statement of Problem and Substantiation for Public Comment

Inspector Feck's proposal does not prohibit the retention of abandoned or incomplete wiring so long as it is in maintained in safe condition. Supporting and securing it is a bit different, even though it does have an impact on insulation integrity. I do not believe it is important enough to secure and support incomplete and abandoned work as though it were expected to be used again. Anyone knowledgable and skillful intentionally reenergizing such work will first make sure it is appropriately supported and secured, as well as being otherwise intact.

The CMP does not dispute NECA's assertion that incomplete wiring installations should also avoid these defects. Therefore, let's remove the word "Completed." No one reasonable is going to take this as forbidding the brief grounding of a conductor in the course of ringing out a circuit, any more than they forbid the temporary removal of a required cover plate for the purpose of testing.

Related Item

• PI 952 • PI 1159

Submitter Information Verification

Submitter Full Name: David Shapiro
Organization: Safety First Electrical
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 03 03:06:49 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected
Resolution: To require incomplete work to always be terminated is overly restrictive.

Public Comment No. 1284-NFPA 70-2021 [Section No. 110.8]

110.8 Wiring Methods.

Only wiring methods recognized as suitable are included in this *Code*. The recognized methods of wiring shall be permitted to be installed in any ~~type of building, occupancy, or~~ premises wiring system, except as otherwise provided in this *Code*.

Statement of Problem and Substantiation for Public Comment

By adding premises wiring systems there is no need to include buildings and occupancies.

Related Item

• FR 8532

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Ryan Jackson
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 11 15:43:54 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: The use of the defined term “premises wiring system” does not include any reference to building or occupancy types, therefore keeping the reference to those terms adds more clarity to this section.

Public Comment No. 659-NFPA 70-2021 [Section No. 110.12(A)]

(A) Unused Openings.

Unused openings, other than those intended for the operation of equipment, those intended for mounting purposes, or those permitted as part of the design for listed equipment, shall be closed to afford protection substantially equivalent to the wall of the equipment. Where metallic plugs or plates are used with nonmetallic enclosures, they shall be recessed at least 6 mm (¼ in.) from the outer surface of the enclosure.

I.N. Enclosure overmolds and overlays intended to reduce air infiltration may not provide protection substantially equivalent to the box wall.

Statement of Problem and Substantiation for Public Comment

These designs will be relatively new to workers. An electrician or inspector who sees a component of a box that is part of the OEM design but is not intended to serve electrical enclosure may well assume that it is equivalent to the box walls. This is how we are wired, at least many of us, not the least by Code rules. Example: manufacturers are permitted to supply mounting screws that do not offer two full machine threads in contact with an opening for bonding per 250.8, and because they are part of a listed product, we are trained by 250.8(8) to accept them; also by 404.10(B) and 406.5.

Related Item

• pi 1605

Submitter Information Verification

Submitter Full Name: David Shapiro
Organization: Safety First Electrical
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 03 08:02:48 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: The current language adequately addresses the integrity of the equipment by addressing the closure of the openings in equipment.

Public Comment No. 1285-NFPA 70-2021 [Section No. 110.12(C)]

~~**(C)** Cables and Conductors.~~

~~Cables and conductors installed exposed on the surfaces of ceilings and sidewalls shall be supported by the building structure in such a manner that the cables and conductors will not be damaged by normal building use. Such cables and conductors shall be secured by hardware including straps, staples, cable ties, hangers, or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with 300.4 and 300.11 . Nonmetallic cable ties and other nonmetallic cable accessories used to secure and support cables in other spaces used for environmental air (plenums) shall be listed as having low smoke and heat release properties.~~

~~Informational Note No. 1: See NFPA 90A-2021, *Standard for the Installation of Air-Conditioning and Ventilating Systems* , 4.3.11.2.6.5 and 4.3.11.5.5.6, for discrete combustible components installed in accordance with 300.22(C) .~~

~~Informational Note No. 2: Paint, plaster, cleaners, abrasives, corrosive residues, or other contaminants may result in an undetermined alteration of optical fiber cable properties.~~

Statement of Problem and Substantiation for Public Comment

This material was added in the 2020 NEC under the assumption that an associated set of relocations was going to occur. The relocations DID NOT occur, and as such this language should never have been added in the first place. The original substantiation was as follows (with emphasis added by me): "This revision coordinates with POTENTIAL actions to relocate the content of sections 760.24, 770.24, 725.24, 800.24, 820.24, 830.24, and 840.24 to a new Section 110.12(C). This is the recommendation of the Correlating Committee Usability task group to improve the usability of Chapters 7 and 8. This action would support consolidation of redundant requirements and relocating them into a new general rule."

As currently written, it DOES NOT apply to Chapter 8 [90.3], but does apply to more than just the limited-energy cables in 725, 760, and 770. The fact is, it applies to ALL cables, including those mentioned in Chapter 3. Because it applies to Chapter 3 cables we have redundant and yet incomplete language. Why are you referring me to 300.4 and 300.11? What about the rest of Article 300, all of which applies to Chapter 3 and only some of which applies to 725-770? The CMP acknowledged that the informational note about optical fiber cables does not belong here, but this entire section does not belong for the exact same reason.

Related Item

• FR 8358 • PI 1266 • PI 517

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Ryan Jackson
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 11 15:46:18 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution:	CMP-1 supports consolidation of redundant requirements and relocating them into a general rule. CMP-1 defers to the Correlating Committee to address this issue of redundancy.

Public Comment No. 1499-NFPA 70-2021 [Section No. 110.12(C)]

(C) Cables and Conductors.

Cables and conductors installed exposed on the surfaces of ceilings and sidewalls shall be supported by the building structure in such a manner that the cables and conductors will not be damaged by normal building use. Such cables and conductors shall be secured by hardware including straps, staples, cable ties, hangers, or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with 300.4 and 300.11. Nonmetallic cable ties and other nonmetallic cable accessories used to secure and support cables in other spaces used for environmental air (plenums) shall be listed as having low smoke and heat release properties.

Informational Note No. 1: Accepted industry practices are described in ANSI/NECA/FOA 301-2016, Standard for Installing and Testing Fiber Optic Cables, and other ANSI-approved installation standards

Informational Note No. 2: See NFPA 90A-2021, *Standard for the Installation of Air-Conditioning and Ventilating Systems*, 4.3.11.2.6.5 and 4.3.11.5.5.6, for discrete combustible components installed in accordance with 300.22(C).

Informational Note No. ~~2~~ 3 : Paint, plaster, cleaners, abrasives, corrosive residues, or other contaminants may result in an undetermined alteration of optical fiber cable properties.

Statement of Problem and Substantiation for Public Comment

The proposed revision was to revise the date of the standard, not to delete it. There was no substantiation provided by CMP-1 to delete it. What was proposed in PI 886 was to revise the date to 2016. The panel statement says nothing about deleting it or does the statement provide a reason.

Related Item

• FR 8358

Submitter Information Verification

Submitter Full Name: Agnieszka Golriz
Organization: NECA
Street Address:
City:
State:
Zip:
Submittal Date: Sun Aug 15 16:21:15 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: Per 3.1.3 of the NEC Style Manual, informational notes shall only be used where necessary to support or improve usability of the associated requirement. If an informational note is needed to explain the text of the document, consideration should be given to rewriting the text of the document to make the rule clear. The proposed informational note appears in 770.24.

Public Comment No. 1028-NFPA 70-2021 [Section No. 110.12 [Excluding any Sub-Sections]]

Electrical equipment shall be installed in a ~~professional~~ knowledgable and skillful manner.

Informational Note: See ANSI/NECA 1-2015, *Standard for Good Workmanship in Electrical Construction,* and other ANSI-approved installation standards for information on accepted industry practices.

Statement of Problem and Substantiation for Public Comment

"Neat and workmanlike" finally is no more in the Code. We're all for this. Should it be replaced by "professional and skillful," as in the First Draft? Professionals are evaluated in terms of Knowledge, Skills, and Abilities (KSAs), per NFPA 1078. So "skillful" seems redundant–if "professional" really is necessary. Aside from appearance, it is not clear that there is an additional, critical element to professionalism beyond compliance and skillful installation.

When inspecting, we evaluate relevant knowledge by seeing whether the installation shows understanding of the relevant products and standards; 110.3 (B) addresses this for installation of listed equipment, but not all equipment requires listing.

We are concerned with abilities only in terms of how they are demonstrated in the way knowledge and skills were applied. For example, "fine motor" abilities may be needed to use torque screwdrivers, but we're not interested in the abilities as stand-alone qualities, just in the way installations demonstrate their application to that fine skill.

A sloppy splice may be less than neat, but the critical factor is whether it is performed skillfully enough to avoid damaging the conductors or losing strands; to keep them tightly bound so as to avoid high impedance or in fact risking that they come loose; and to keep them all adequately insulated. So skillful installation is a critical element, to complement compliance with the letter of the Code and knowledge of the products.

While professional appearance is nice, in general requiring it goes beyond the Code's purpose described in 90.1. Because neatness is an additional subjective element, we should minimize its use as a criterion. Where neatness, or "professional appearance" is particularly important to safety, we have more specific language, such as "legible" as in 110.21(B)(2) Exception, 110.22, 225.52 (B) Exception, and 300.45, or "clearly legible" as in 410.140 and 620.52(B).

So far, no additional element to the term "professional" has been described in the public discussion, so it's reasonable to assume it refers to KSAs. Rather than "The installation of that beam clamp was unprofessional," let's say "The way that beam clamp was used shows a lack of knowledge of how it's designed to be used."

Related Item

• PI3936

Submitter Information Verification

Submitter Full Name: David Shapiro
Organization: George Washington Chapter of IAEI
Affiliation: George Washington Chapter of IAEI
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 05 20:10:18 EDT 2021

Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: The use of the term “professional and skillful” aligns with the recommendations of the NEC Style Manual. The terms “neat” and “workmanlike” are considered vague and unenforceable per 3.2.1 of the NEC Style Manual.

Public Comment No. 1226-NFPA 70-2021 [Section No. 110.12 [Excluding any Sub-Sections]]

Electrical equipment shall be installed in a ~~professional~~ neat and ~~skillful~~ workmanlike manner.

Informational Note: See ANSI/NECA 1-2015, *Standard for Good Workmanship in Electrical Construction,* and other ANSI-approved installation standards for information on accepted industry practices.

Statement of Problem and Substantiation for Public Comment

There is no reason whatsoever to change the wording of this. It has remained untouched for decades, and no benefit is gained by changing the wording for the sake of changing the wording.

Related Item

• First Revision No. 8357-NFPA 70-2021 [Section No. 110.12 [Excluding any Sub-Sections]]

Submitter Information Verification

Submitter Full Name: Timothy Kunkel
Organization: Tim Kunkel Electric
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 10 23:43:48 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: The use of the term “professional and skillful” aligns with the recommendations of the NEC Style Manual. The terms “neat” and “workmanlike” are considered vague and unenforceable per 3.2.1 of the NEC Style Manual.

Public Comment No. 1497-NFPA 70-2021 [Section No. 110.12 [Excluding any Sub-Sections]]

Electrical equipment shall be installed in a ~~professional and skillful manner~~ neat and workmanlike manner .

Informational Note: See ANSI/NECA 1-2015, *Standard for Good Workmanship in Electrical Construction,* and other ANSI-approved installation standards for information on accepted industry practices.

Statement of Problem and Substantiation for Public Comment

There has been no evidence of a problem with the current wording from a usability standpoint. The word “workmanlike” does appear in the NEC Style Manual as one to be avoided, where possible, but there are many other such words in the list that appear multiple times throughout the NEC.
This revision actually creates a correlation issue with other sections of the NEC (760.24 770.24 and 800.24 for example) and other NFPA standards that use the same term (such as NFPA 72, 780 and others), all beyond the purview of CMP-1.
The terms “professional” and “skillful” are equally unenforceable and do nothing to improve the application of this section as these terms relate to the skill or title of a person, as compared to “workmanlike manner” which is relating to the mechanical execution of the work, which is the title of this section. The key here is that one can look at the installation and determine if is is indeed installed in a workmanlike manner. The terms “skillful” and “professional” are also subjective and create enforceability challenges, once again, including a characteristic that relates to an individual’s credentials and standing, rather than the mechanical execution of the work itself.
CMP-1 need look no further than the standard dictionary definition of “workmanlike” to realize that it is the correct term. “Workmanlike” means showing efficient competence. “Workmanlike” is the correct term.
Resolve this proposed revision and restore this section of the NEC to how it existed in the 2020 edition.

Related Item

• FR 8357

Submitter Information Verification

Submitter Full Name: Agnieszka Golriz
Organization: NECA
Street Address:
City:
State:
Zip:
Submittal Date: Sun Aug 15 16:18:59 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: The use of the term “professional and skillful” aligns with the recommendations of the NEC Style Manual. The terms “neat” and “workmanlike” are considered vague and unenforceable per 3.2.1 of the NEC Style Manual.

Public Comment No. 1246-NFPA 70-2021 [Section No. 110.13(A)]

(A) Mounting.

Electrical equipment shall be firmly secured to the surface on which it is mounted. The mounting surface must be constructed to resist damage to the electrical equipment during normal use and environmental conditions. Wooden plugs driven into holes in masonry, concrete, plaster, or similar materials shall not be used.

Informational Note: See NFPA 5000-2015 Building Construction and Safety Code, the International Building Code (IBC), and the International Residential One- and Two-Family Dwellings (IRC) for foundations, buildings, and structures to which equipment is mounted.

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.

The rewritten proposed language gives requirements for the structure in which electrical equipment is to be mounted without inserting any construction or building code requirements for non-electrical equipment. The guidance for the construction of these structures covered in the informational note should be added as proposed by PI 4649 in the first draft. In the process of doing electrical inspections, we have witnessed electrical equipment that has become damaged because the structure did not provide rigid structural support. Wind gusts over a period of time was enough there to damage the electrical equipment because of the movement and vibration. Also, we have also seen service equipment mounted to pallets that are simply placed on the ground. These make shift structures do not provide much support, but 110.13 does not address the lack of proper structural support, only how it is attached to the mounting surface.

Related Item

• PI 2562 • PI 4649

Submitter Information Verification

Submitter Full Name: Dean Hunter
Organization: Minnesota Department of Labor
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 11 12:12:43 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: The proposed language is beyond the scope of this requirement. It is not necessary to dictate mounting surface construction. The concerns of the submitter can be enforced through other existing NEC requirements such as 110.12 as, per its title, these requirements address mechanical execution of work.

Public Comment No. 658-NFPA 70-2021 [Section No. 110.13(B)]

(B) Cooling.

Electrical equipment that depends on the natural circulation of air and convection principles for cooling of exposed surfaces shall be installed so that room airflow over such surfaces is not prevented by walls or by adjacent installed equipment. For equipment designed for floor mounting, clearance between top surfaces and adjacent surfaces shall be provided to dissipate rising warm air.

Electrical equipment provided with ventilating openings shall be installed so that walls, ceilings, or other obstructions do not prevent the free circulation of air through the equipment.

Statement of Problem and Substantiation for Public Comment

Unfortunately, installers mount equipment wherever they're allowed to do so. The logic behind adding "ceilings" is similar to that which makes us specify clear space above equipment, and in front of it: people tend to make use of all available room.

Forbid mounting right up by ceilings because if equipment is permitted to be mounted with ventilation openings close to ceilings, hot air will pool.

This is partly a design consideration, like Article 310's requirements, reducing the chance of premature failure due to overheating. It is also a safety concern, because overheating equipment can create hazards.

Related Item

• PI 4282

Submitter Information Verification

Submitter Full Name: David Shapiro
Organization: Safety First Electrical
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 03 07:38:25 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected
Resolution: The intent of this recommendation is met through the existing phrase "or other obstructions."

Public Comment No. 1655-NFPA 70-2021 [Section No. 110.14(A)]

(A) Terminals.

Connection of conductors to terminal parts shall ensure a mechanically secure connection without damaging the conductors and shall be made by means of pressure connectors (including set-screw type), solder lugs, or splices to flexible leads. Terminal connections shall not be made to the drive surfaces of either wire-binding screws or set-screw-type pressure connectors unless the connecting device is specifically listed for this connection method . Terminal connections shall not rely solely upon friction, magnetic, or cantilevered-spring contact with wire-binding screws or set-screw-type pressure connectors unless the connecting device is specifically listed for this connection method . Connection by means of wire-binding screws or studs and nuts that have upturned lugs or the equivalent shall be permitted for 10 AWG or smaller conductors.

Terminals for more than one conductor and terminals used to connect aluminum shall be so identified.

Statement of Problem and Substantiation for Public Comment

This code language is to address concerns surrounding faceplates covered by 406 in CMP 18. In CMP 18 we left the door open to such devices if properly sanctioned. In the First Draft the receptacle manufacturer is the one who must sanction this, but I have submitted public comments to change this authority to the listing agency. Either way, 110.14 creates a correlating issue with the code as it is an outright prohibition on something that could easily become acceptable practice following proper evaluation by the appropriate entity.

Related Item

• FR-8556-NFPA 70-2021

Submitter Information Verification

Submitter Full Name: Jason Potterf
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City:
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Zip:
Submittal Date: Mon Aug 16 23:20:09 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7788-NFPA 70-2021
Statement: The deleted text was added by FR 8556. The revision to prevent the use of various types of connection methods may have the unintended consequence of conflicting with established equipment construction specifications. For example, the use of spring type contacts has been used for years in electrical switchgear for applications such as circuit breaker control power and potential transformers connections.

The word “electrical” was added to provide additional clarity about the connection.

CMP-1 considers certification of connection methods for equipment to be covered within the scope of Article 406 under the purview of CMP-18.

Public Comment No. 1727-NFPA 70-2021 [Section No. 110.14(A)]

(A) Terminals.

Connection of conductors to terminal parts shall ensure a mechanically secure connection without damaging the conductors and shall be made by means of pressure connectors (including set-screw type), solder lugs, or splices to flexible leads. Terminal connections shall not be made to the drive surfaces of either wire-binding screws or set-screw-type pressure connectors. Terminal connections shall not rely solely upon friction, magnetic, or cantilevered-spring contact with wire-binding screws or set-screw-type pressure connectors. Screw heads shall not be used for electrical contacts by spring members unless the contact does not rely solely on spring force to make the connection and has been Listed for the purpose. _ Connection by means of wire-binding screws or studs and nuts that have upturned lugs or the equivalent shall be permitted for 10 AWG or smaller conductors.

Terminals for more than one conductor and terminals used to connect aluminum shall be so identified.

Statement of Problem and Substantiation for Public Comment

While the FR 8556 text clearly prohibits spring contacts to draw current from the head(s) of device screws, this addition addresses much of the concerns discussed in various industry group meetings. Modifying the rule to apply to those spring contacts that rely solely on springs is maintained while allowing for modification where additional means (besides a spring) are utilized to maintain a low resistance contact. The addition also seeks a NRTL Listing providing examination of the additional means by testing. The NRTL can also establish the maximum current such a connection can safely carry as many industry discussions spoke of limiting the connection to several milliamperes as well as other issues. In addition, this additional sentence could serve to resolve the correlation issues with two CMP 18 First Revisions, FR 7564 and 7603, as noted by the CC.

Related Item

• FR 8556

Submitter Information Verification

Submitter Full Name: Steve Campolo
Organization: Leviton Manufacturing Company,
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City:
State:
Zip:
Submittal Date: Tue Aug 17 15:18:32 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7788-NFPA 70-2021
Statement: The deleted text was added by FR 8556. The revision to prevent the use of various types of connection methods may have the unintended consequence of conflicting with established equipment construction specifications. For example, the use of spring type contacts has been used for years in electrical switchgear for applications such as circuit breaker control power and potential transformers connections.

The word “electrical” was added to provide additional clarity about the connection.

CMP-1 considers certification of connection methods for equipment to be covered within the scope of Article 406 under the purview of CMP-18.

Public Comment No. 174-NFPA 70-2021 [Section No. 110.14(A)]

(A) Terminals.

Connection of conductors to terminal parts shall ensure a mechanically secure connection without damaging the conductors and shall be made by means of pressure connectors (including set-screw type), solder lugs, or splices to flexible leads. ~~Terminal connections shall not be made to the drive surfaces of either wire-binding screws or set-screw-type pressure connectors. Terminal connections shall not rely solely upon friction, magnetic, or cantilevered-spring contact with wire-binding screws or set-screw-type pressure connectors. Connection~~ Connection by means of wire-binding screws or studs and nuts that have upturned lugs or the equivalent shall be permitted for 10 AWG or smaller conductors.

Terminals for more than one conductor and terminals used to connect aluminum shall be so identified.

Statement of Problem and Substantiation for Public Comment

There are several fundamental problems with the First Draft, in terms of the basis even for its need, the potential unintended impact and its particular execution:

1. Is this restraint of trade or based on technical substantiation?
2. It prohibits the use of a more safe technology in spring-tensioned contacts
3. It will unintentionally impact existing general connection means in this Article by disallowing and demonizing friction
4. It has problems with its terminology

The proposed changes in the First Draft should be wound back mostly to the original wording in the 2020 NEC, for the above reasons, which are detailed further below:

----- 1. Is this Restraint of Trade and Where is the Required Technical Substantiation?

I concur with the negative ballot with comment from Mr. James Pierce (below). There have been no technical details provided to substantiate the need to change this general section of the NEC. This change would effectively ban an innovative spring-tensioned contact technology from a company SnapPower, by its competitors, through the use of fear tactics, trying to make you believe there is a “boogeyman” out there. The reality is that there are over 4 million of these NRTL listed products in the field -- most of them with two NRTL listing marks. SnapPower has offered to allow the NRTLs to disclose the record to those in the CMPs and STP514D. These have been installed over six years, with no safety hazards reported that are related to the spring-tensioned contacts. There is no “boogeyman”, it turns out. There are however good constructions such as SnapPower’s which are intentional in their design efforts, that have earned that exceptional record in the field by the use of proper materials and accommodating the installed base of receptacles in the field. An effort that should not be banned but rather be leveraged to develop a standard in the form of a new Annex E of UL514D (proposal 8/13/21), to encourage similar success by other manufacturers of illuminated cover plates with spring-tensioned contacts.

“I do not accept the ‘substantiation’ given for this FR. There were vague references to “troubling” issues with spring contacts, but no substantive technical details or field issues. Sounds to me like a restraint of trade against this new/innovative product design. Friction and spring contacts have been used since the duplex receptacle came into being. Magnetic connections have been used for 30 years (?) in counter top cooking appliances. The innovative devices in question are LED powered and consume mA current. If we want to update 110.14A, let’s provide good, sound technical reasons for doing so; not “troubling hearsay.” --- Pierce, James F. (ETL)

A similar lack of substantiation for a like attempt to ban the spring-tensioned contacts was noted by Mr. Jason D. Potterf in his negative ballot with comment for FR-7564 in CMP-18.

----- 2. Spring-Tensioned Contacts are Inherently Safer in the Big Picture

2A. Four Million Less Traditional Nightlights with Plug Blades Accessible to Children’s Fingers

With these innovative nightlights installed with spring-tensioned contacts, there is no need to have traditional pluggable nightlights, where their blades are easily accessible to children's inquisitive fingers. For this reason alone, such spring-tensioned contact designs should be encouraged, rather than discouraged or banned; they keep the live parts inside the electrical box where they are inherently more safe.

2B. Four Million Less Opportunities for Mis-installation to Remove a Safe and Functioning Receptacle.

The other more traditional, competitive technology to illuminated cover plates with spring-tensioned contacts are receptacles with integrated nightlight functionality. It is common for Do-It-Yourselfers (DIYers) to replace receptacles, where there is the hope that he/she will correctly do what we count as up to 12 things required for a safe installation -- from turning off the circuit breaker to the receptacle, to tightening the screws with the proper torque, according to the DIYers' torqueing means, to stuffing blindly the receptacle with wires back into the box without damaging or disconnecting them. Due to the ease of installation and lower cost of cover plates with spring-tensioned contacts, they are an affordable way to have a more safe nightlight, without requiring expertise to replace a receptacle nor the need to hire an electrician, as receptacle manufacturers often instruct.

2C. Four Million Less Dangerous Wire Runs Past the Sharp-Edged Receptacles/Yokes to the Cover Plates

By banning spring-tensioned contacts, this change to the NEC would require that the #12 and #14AWG wires be routed past the sharp edges of the receptacle (the yoke in particular) from the back of the box, have enough slack to allow connection to terminals on the cover plate that is pulled out in front of the wall and receptacle, and then have that needed slack somehow jammed back into the box, past and not into the front of the receptacle where it is sure to be pinched by the incoming plate in some installations. This only seems like a good idea to those who have not tried it. As a result, there have not been many listings of cover plates with these traditional wiring means. In fact, there is only one traditionally-wired illuminated cover plate listed with UL, despite UL514D being updated in 2013 to allow them. Frankly, people don't want them and they are not a safe way to do this. UL514D is presently written to allow constructions that nobody wants, it seems, which harkens to the restraint of trade point above. We do have a proposal to UL514D that just returned from review by the THSC (in front of STP514D dated 8/13/21) and addresses safely designing and testing the spring-tension contacts that consumers want. The traditional wiring methods in this case are more dangerous, people don't want them, and manufacturers are not making them. Why is the NEC then going in this direction?

----- 3. Article 110.14(D) is not the proper place to address cover plates with spring-tensioned contacts!

3A. Potential Unintended Impact on Other Wire Terminating Means

Article 110.14(A) of the NEC is general in nature, and while this proposed revision is attempting to ban spring-tensioned contacts in illuminated cover plates, these changes could unintentionally impact other electrical installations that are not being considered in this First Draft. According to UL's online correlation between the NEC's Article 110.114 and components on its database, there are five categories of products that are directly associated with this Article: ZMVV for Wire Connectors and Soldering Lugs in UL486A/B/C, ZMLF for Bare and Covered Ferrules, ZMOW for Wire-Connector Adapters, ZMWQ for Sealed Wire-Connector Systems, and AALZ for Electrical Equipment generally. Such field wiring connections in this last category for electrical equipment include additional product types such as circuit breakers, supplementary protectors, switch controlgear, service disconnects, transfer switches, terminal blocks, to name only a few that terminate field wiring commonly. We are encouraging a wider participation, which should spend more time involving those who would be impacted by the change, and we consider it presumptuous for a receptacle manufacturer to change general requirements for these other industries to serve its own purposes, without such involvement. Ironically, this revision from a receptacle manufacturer could prevent the use of push-in terminals commonly on the back of its own receptacles! This sounds exactly like one of those "terminal connections that rely solely upon friction". Is friction acceptable in receptacles' push-in terminals, but not for other applications, or would the receptacle standard UL498 have to disallow the further use of such terminals with the dubious publication of this NEC revision? This wording and its implications need to be seriously re-examined, or better, revert to the original wording.

Such a similar concern was expressed by Mr. Louis Barrios, in his negative ballot with comment for FR-8556. "Proposed change to prevent the use of spring type connections may have the unintended consequence of prohibiting the use of spring type contacts used for years in electrical switchgear in applications such as circuit breaker control power and potential transformers." -- Barrios, Louis A.

3B. What is the Difference between Spring-Tensioned Contacts and Existing Technologies Using Friction,

Solely

There are many installations that presently use spring-tensioned terminals for electrical connections, such as terminal blocks with activating levers/arms, push-to-insert and remove tabs/buttons (no screws) and push-in terminals that depend on friction, not to mention twist-on wire nuts, among many other examples. With this revision, are these NRTL certified components no longer suitable to be installed, due to this proposed update with the wording that emphasizes “mechanically secure” and demonizes “friction”? The manufacturers of general-use components such as these are certainly not driving these changes, and such a change to the general requirements in Article 110.14 to “not rely solely upon friction” would be a challenge to a maker of a terminal block or twist-on wire nut.

For some perspective, twist-on wire nuts with "solely friction" that are deemed acceptable to carry a 20A load have much fewer tests in UL486C, than the SnapPower Annex E proposal under UL514D which have 19 tests for spring-tensioned contacts that are intended to carry less that 10 mA.

There should be justification for this revision about what a traditional screw terminal depends upon, if not “solely friction”, once one lets go of the screwdriver after tightening. For the long-certified twist-on wire nuts, push-in terminals on a receptacle, or terminal blocks' levers that flip closed on the wire or buttons that push-to-insert and release, because friction is unacceptable “solely”, what is the second acceptable required means in addition to friction that make these traditional connections acceptable? In this First Draft, this has effectively put in front of the electrical inspector the equation: FRICTION + x = ACCEPTABLE, solve for x. What would that answer be for a screw terminal even? Is there x? Lots and lots of friction is okay in a screw but no additional x? I think what you are left to admit is that there is just friction being depended upon, and this puts an impossible task in front of the electrical inspector, as worded. So what are we really expecting to be done in the field? The inspectors are likely confirming that the termination means are NRTL listed and used in accordance with their intended use and instructions; that is the inspectable effort really. The component manufacturer is really the one that has to prove the connection is “mechanically secure” in practice when conducting tests with the NRTL under the more specific requirements of UL standard. For example, they pull with 25 lbs-f on a #14AWG conductor in a twist-on wire nut under UL486C, or for “spring-force connections” of terminal blocks in UL1059, run a temperature test for 30 days continuously for such assurance of mechanical securement. But friction is always involved, and often “solely”, and this wording should frankly be unacceptable as it suggests that the inspector can deem terminations unacceptable based on an apparent, visible, blatant use of friction (gasp), and that overrides the acceptance based on component listing. This wording in 110.14 has not changed that much over the years, and these changes are attempting to fix something that simply isn’t broken, and then proceeds to break other things.

------ 4. Terminology Problems with the First Draft

4A. With the heading of "Terminals", there is the implication of terminating something, where the common application would be to terminate a wire conductor. Interestingly, terminals are not a defined term in Article 100 and probably should be. The proposed new wording in the body of text then changes that to "terminal connections", which appears to be an effort to increase the scope of the requirements beyond traditional terminals that terminate a wire -- maybe this is for any metal that touches other metal now? This should be a defined term, so that all understand what is covered and what is not. For example, at the rear of listed circuit breakers that push into a busbar in the rear of an electrical panel, are those "terminal connections" now? They are metal, depend on friction for their connection (yes, another example), but without wire, like SnapPower's spring-tensioned contacts; so would they be in the scope of a "terminal connection" or are people just going to know this means spring-tensioned contacts for an illuminated cover plate? To be clear, spring-tensioned contacts do not terminate a wire, nor are they a wire. This revision ostensibly expands the undefined concept of terminals, lumps spring-tensioned contacts in there despite not terminating a wire, and then disallows friction to be used, which would catch a number of other traditional components in its net, as well. The main consideration here should be to confirm that these innovative contacts, that solve other broader installation and safety issues in Item 2 above, simply don’t adversely affect a wire termination, not that they are a terminal in the sense that Article 110.14 intended. There should not be the presumption here that spring-tensioned contacts adversely affect the traditional terminals, due to the exceptional record in the field. Passing the proposed new test program in Annex E of UL514D will show those spring-tensioned contacts that tread lightly on terminals. The contact that is being banned here is not terminating the wire, nor intended to be a general means to make electrical connections in a building for high current connections. It is intended to be a low-current connection means that is integral to the cover plate that is replacing the connection where it is not safe to route a wire due to sharp edges of a receptacle yoke and limited space, to the cover plate in front of it. Just like press-in terminals for receptacles have a limited time and place -- only for 5-15R or 6-15R receptacles, with solid copper of #14AWG only -- there is a specific need and a place for spring-tensioned contacts, where they can be evaluated to be suitable for their low-current mA loads in an illuminated cover plate. If there is a concern for such connections being used generally as a termination for a

20A current path, then acceptance for these means should be done elsewhere in the specific requirements for cover plates, such as in UL514D, without banning them in the NEC as a wire termination which they are not. The two sentences should be deleted from the First Draft until there is more definition of these terms, and the impact on other unintended areas is considered more carefully.

4B. The term "drive surface" is problematic since, taken literally, means the recessed portion of the screw that the tip of Phillips screwdriver in fact comes into contact. This suggests that the spring-tensioned contacts could sit on the top of the screw, as it does presently, where the screwdriver tip never contacts. My screwdriver never touches the part of the screw that the spring-tensioned contacts do. “Drive surface” does not have a common definition when searching on the internet for tribal knowledge, nor does it have a place in the NEC as a standardized term, more importantly. Again, this is just not well thought out, and does not correlate with FR-7603, which attempts to ban connections to “connections tightened by use of tools”.

By the way, there are competitive products to SnapPower’s which have the connection means actually to the break-away tab on the receptacle, and this proposed wording (and FR-7603) needs to be better thought out. With this wording, SnapPower’s products that intentionally target the bottom screw based on extensive research for where that screw sits would be banned, but a design that targets a potentially needed isolation gap would be allowed? Should Article 110.14 really get into these types of specifics for illuminated cover plates?!

4C. While the term “mechanically secure” connection at first might sound a bit better than a “thoroughly good” one, in terms of its subjectivity, it is not. The mention of “mechanically secure” suggests that the suitability can be judged simply by looking at it, as if it is an inspectable pass/fail for an inspector based on an eyeball test. If an inspector looks at the push-in terminals of a standard receptacle, he/she could simply disallow their use based on not being “mechanically secure” and using friction solely, by the wording of this revision. How would an inspector even see inside this receptacle? Terminal blocks without screws but lever arms and twist-on wire nuts would certainly not by default be deemed as “mechanically secure” just looking at their sole dependence on friction. This proposal takes this good-sounding "mechanically secure" and then goes on to discount or disallow friction -- the inspector is supposed to know that screws which depend solely on friction are acceptable -- because they have lots and lots of friction?! -- but other types of friction are not acceptable? When describing screws on its page, Wikipedia uses the word friction 20 times, describing the thread angle and surface area as affecting ultimately the securement of the screw, using varying amounts of… wait for it… friction. Truly inspectable criteria involves confirming the use of certified components and the proper use of their intended connection means, and trusting the evaluation of the component to establish a "mechanically secure" connection. A receptacle can terminate the wires with push-in terminals since those are included in the intended use/instructions, and the receptacle is listed by an NRTL; and that is a judgement that an inspector could, and does, use without a dependency on levels of friction or the combination of friction and a second safeguard (the mysterious x). From this perspective, suddenly “thoroughly good” is a bit more palatable and certainly could include the inspector’s decision to accept the connection due to properly using an NRTL listed means. He/she can see the listing mark on the receptacle if not how the push-in terminal itself inside is constructed for its objectionable friction. I am not opposed to the use of “mechanically secure” in the above but it is really mechanically secure based on the use of certified components and their detailed evaluation, and no such eyeball litmus test based on friction.

4D. My understanding is that when writing standards’ language, there should be an attempt to say what should be done, as a positive, rather than detailing out the prohibited options, since there can always be another objectionable option that simply wasn’t thought of at the time. The use of Velcro, tapes, and dabbled-on adhesive come to mind for an expanded list, as examples. Is such a list for what cannot be done for general terminations going to serve any benefit in 110.14? Again, this revision needs more attention and should revert to its original 2020 wording in the Second Revision!

Conclusion:
There are significant flaws with this First Draft on many levels as detailed above. At a minimum, such considerations should be made in Article 406.6 (CMP-18), and not here. The wording should be as it was in NEC 2020, with the possible exception for “mechanically secure” as long as it is not then coupled with demonizing friction, and depending on the inspector to decide what friction is acceptable, or when it is coupled with something else. As an alternative to deleting the two sentences, you could direct this to allow "solely friction" for certified components as a positive, I suppose, but then you would have to justify why a standard screw would be acceptable without any such certification. However, instead of driving this from above in the NEC, the decision about what is acceptable or not -- FRICTION + x, or "solely friction" -- needs to be left to the component safety standards, as it has traditionally been done. Please delete those two sentences.

Related Item

• FR-8556

Submitter Information Verification

Submitter Full Name: C Lee Ould
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Affiliation: SnapPower
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Zip:
Submittal Date: Thu Jul 08 19:53:13 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-7788-NFPA 70-2021

Statement: The deleted text was added by FR 8556. The revision to prevent the use of various types of connection methods may have the unintended consequence of conflicting with established equipment construction specifications. For example, the use of spring type contacts has been used for years in electrical switchgear for applications such as circuit breaker control power and potential transformers connections.

The word “electrical” was added to provide additional clarity about the connection.

CMP-1 considers certification of connection methods for equipment to be covered within the scope of Article 406 under the purview of CMP-18.

Public Comment No. 1762-NFPA 70-2021 [Section No. 110.14(A)]

(A) Terminals.

Connection of conductors to terminal parts shall ensure a mechanically secure connection without damaging the conductors and shall be made by means of pressure connectors (including set-screw type), solder lugs, or splices to flexible leads. Terminal connections shall not be made to the drive surfaces of either wire-binding screws or set-screw-type pressure connectors~~. Terminal connections shall not rely solely upon friction, magnetic, or cantilevered-spring contact with wire-binding screws or set-screw-type pressure connectors. Connection~~ , unless the connection means are listed for the use. Connection by means of wire-binding screws or studs and nuts that have upturned lugs or the equivalent shall be permitted for 10 AWG or smaller conductors.

Terminals for more than one conductor and terminals used to connect aluminum shall be so identified.

Statement of Problem and Substantiation for Public Comment

I agree with the Correlating Committee Note that the action by CMP 1 needs to be correlated with CMP 18 actions. The best way to do this would be for this section to remain as a "General" section and for CMP 18 to deal with the details. The proposed language retains the concept of "mechanically secured" as desired by CMP 1 and by generally requiring that the connection means be listed. Any additional details, as may be required, should be addressed by CMP 18 in Article 400.

In addition, the following substantiation should be noted:

The language in FR 8556 represents a Restraint of Trade without any technical substantiation. This was identified in the negative ballot submitted by James Pierce. There has been no technical details provided to substantiate the need to change this basic section of the NEC to include a ban an innovative spring-tensioned contact technology by competitors. The reality is that spring-tensioned contacts have an excellent safety record based upon over 4 million of these NRTL Listed products in the field, installed over six years.

In addition, spring-tensioned contacts are inherently safer when one considers the big picture. Where these innovative nightlights are installed, there is no need to have traditional pluggable nightlights, where their blades are easily accessible to children. For this reason alone, such spring-tensioned contact designs should be encouraged, rather than discouraged or banned; they keep the electrical connections inside the electrical box and are inherently safer there. The other competitive, traditional technology to spring-tensioned contacts, are receptacles with integrated nightlight functionality. It is common for Do-It-Yourselfers (DIYers) to replace receptacles, where there is the hope that they will correctly do as many as 12 things that are required for a safe installation -- from turning off the circuit breaker to the receptacle, stuffing blindly the receptacle with wires back into the box without damaging or disconnecting them, to tightening the screws with the proper torque. Also, by banning spring-tensioned contacts, the First Revision is requiring that the #12 and #14 AWG wiring be routed past the sharp edges of the receptacle (the yoke in particular) from the back of the box, have enough slack to allow connection to the cover plate, and then have that needed service loop jammed back into the box, past and not into the front of the receptacle. There is a reason that there is only one traditionally-wired illuminated cover plate Listed with UL, despite UL514D being updated in 2013 to allow them. SnapPower has a proposal to UL514D that just returned from review by the THSC (dated 8/13/2021) and addresses safely designing and testing the spring-tension contacts that consumers want. The traditional wiring methods in this case are more dangerous, people don't want them, and manufacturers are not making them.

The Public Comment addresses the concerns raised by the Correlating Committee and addresses the technical and Restraint of Trade concerns expressed above.

Related Item

• FR 8556

Submitter Information Verification

Submitter Full Name: William Koffel
Organization: Koffel Associates, Inc.
Affiliation: Representing SnapPower
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 17 16:57:15 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-7788-NFPA 70-2021

Statement: The deleted text was added by FR 8556. The revision to prevent the use of various types of connection methods may have the unintended consequence of conflicting with established equipment construction specifications. For example, the use of spring type contacts has been used for years in electrical switchgear for applications such as circuit breaker control power and potential transformers connections.

The word “electrical” was added to provide additional clarity about the connection.

CMP-1 considers certification of connection methods for equipment to be covered within the scope of Article 406 under the purview of CMP-18.

Public Comment No. 1935-NFPA 70-2021 [Section No. 110.14(A)]

(A) Terminals.

Connection of conductors to terminal parts shall ensure a mechanically and electrically secure connection without damaging the conductors and shall be made by means of pressure connectors (including set-screw type), solder lugs, or splices to flexible leads. Terminal connections shall not ~~be made to the drive surfaces of either wire-binding screws or set-screw-type pressure connectors. Terminal connections shall not~~ rely solely upon ~~friction,~~ magnetic ~~,~~ or ~~cantilevered~~ spring contact with wire-binding screws or set-screw-type pressure connectors. Connection by means of wire-binding screws or studs and nuts that have upturned lugs or the equivalent shall be permitted for 10 AWG or smaller conductors.

Terminals for more than one conductor and terminals used to connect aluminum shall be so identified.

Informational Note: See sections 406.3(H) and 406.6(D) for additional requirements specific to faceplates.

Statement of Problem and Substantiation for Public Comment

Added “electrically” to be consistent with 110.14 requirements for electrically and mechanically secure connections.

Deleted sentence referring to “drive surfaces” as that is not a defined term and could create confusion as to what is being referenced. The relevant product standard defines the permitted termination methods.

This proposal deletes text “friction” because it would prohibit most electrical connections that would be made during an installation. Specifically, most pressure connectors rely solely on friction to create and maintain a mechanically secure connection.

Additionally, the text that was added by FR 8556-NFPA 70-2021 was made in response to PI 1510-NFPA 70-2020 and PI 4639-NFPA 70-2020. The aim of the proposals made in these PIs appear to be to ensure safety when receptacle wall plates which tap power from the wire binding screws of the receptacle are installed. These types of devices and their methods of connection have been addressed by FR 7603-NFPA 70-2020 and FR 7564-NFPA 70-2020 in 403.3(H) and 406.6(D), respectively. Furthermore, CCN 74-NFPA 70-2021 and CCN 104-NFPA 70-2021 has identified that this topic is address in multiple locations and directs correlation of the FRs. Informational Note was added to point to locations in the Code where these applications are specifically addressed.

Related Item

• FR 8556-NFPA 70-2021 • PI 1510-NFPA 70-2020 • PI 4639-NFPA 70-2020 • FR 7603-NFPA 70-2020 • FR 7564-NFPA 70-2020 • CCN 74-NFPA 70-2021 • CCN 104-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:	Wed Aug 18 17:05:09 EDT 2021
Committee:	NEC-P01

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-7788-NFPA 70-2021

Statement: The deleted text was added by FR 8556. The revision to prevent the use of various types of connection methods may have the unintended consequence of conflicting with established equipment construction specifications. For example, the use of spring type contacts has been used for years in electrical switchgear for applications such as circuit breaker control power and potential transformers connections.

The word “electrical” was added to provide additional clarity about the connection.

CMP-1 considers certification of connection methods for equipment to be covered within the scope of Article 406 under the purview of CMP-18.

Public Comment No. 1944-NFPA 70-2021 [Section No. 110.14(A)]

(A) Terminals.

Connection of conductors to terminal parts shall ensure a mechanically secure connection without damaging the conductors and shall be made by means of pressure connectors (including set-screw type), solder lugs, or splices to flexible leads. Terminal connections shall not be made to the drive surfaces of either wire-binding screws or set-screw-type pressure connectors. ~~Terminal connections shall not rely solely upon friction, magnetic, or cantilevered-spring contact with wire-binding screws or set-screw-type pressure connectors.~~ Connection by means of wire-binding screws or studs and nuts that have upturned lugs or the equivalent shall be permitted for 10 AWG or smaller conductors.

Terminals for more than one conductor and terminals used to connect aluminum shall be so identified.

Statement of Problem and Substantiation for Public Comment

The stricken text was added by FR 8556. This text to prevent the use of spring type connections may have the unintended consequence of prohibiting the use of spring type contacts used for years in electrical switchgear in applications such as circuit breaker control power and potential transformers connections.

Related Item

• FR-8556

Submitter Information Verification

Submitter Full Name: Louis Barrios
Organization: Shell Global Solutions
Affiliation: American Chemistry Council
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 18 17:36:24 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-7788-NFPA 70-2021

Statement: The deleted text was added by FR 8556. The revision to prevent the use of various types of connection methods may have the unintended consequence of conflicting with established equipment construction specifications. For example, the use of spring type contacts has been used for years in electrical switchgear for applications such as circuit breaker control power and potential transformers connections.

The word “electrical” was added to provide additional clarity about the connection.

CMP-1 considers certification of connection methods for equipment to be covered within the scope of Article 406 under the purview of CMP-18.

Public Comment No. 246-NFPA 70-2021 [Section No. 110.14(A)]

(A) Terminals.

Connection of conductors to terminal parts shall ensure a mechanically secure connection without damaging the conductors and shall be made by means of pressure connectors (including set-screw type), solder lugs, or splices to flexible leads. ~~Terminal connections shall not be made to the drive surfaces of either wire-binding screws or set-screw-type pressure connectors. Terminal connections shall not rely solely upon friction, magnetic, or cantilevered-spring contact with wire-binding screws or set-screw-type pressure connectors. Connection~~ Connection by means of wire-binding screws or studs and nuts that have upturned lugs or the equivalent shall be permitted for 10 AWG or smaller conductors.

Terminals for more than one conductor and terminals used to connect aluminum shall be so identified.

Statement of Problem and Substantiation for Public Comment

While I share the concern of the original submitters of the public inputs, I have to mention that this proposed language is written such that those skilled in the art, such as electricians, likely won't know its meaning without a reading of the public input that created it. This in part because at this time, there is little if any other assemblies that connect in the same manner as the cover plates that have prompted the public input that created this. Under the proposed language, the NEC would ban the product, it would cease to become available at the electrical supply stores, and the meaning of the added text would be lost and subject to misinterpretation in the future. The next time someone comes up with a novel but dangerous product, that would get added to the paragraph style list of prohibited connections in 110.14. Then it too would die, leaving a husk of language causing confusion, alienation and frustration of users, and misinterpretation. The public inputs that created these will age into obscurity and no one will know the reason for the rule. UL may test some specific applications involving this type of connection and determine that in certain limited circumstances they are safe, but the product won't be allowed and would then require more work to revise the code again. In time, some might use a novel new connection style's not being on the prohibited connections styles list to assert that it should be allowed.

It is also the case that since these spring connections aren't mentioned in 110.14, that if the product isn't listed and/or approved by the AHJ, that it is a violation to use it anyway. The NEC will become a mess of ineffective language, should we try to ban every practice that an electrically knowledgeable person should know better than to make or design.

This language seems to have come from 2 public inputs, each mentioning as the sole reason, some receptacle covers that have integrated lights. It would thus seem more appropriate that this be a matter for article 406 (receptacles). Already, the 2020 NEC requires faceplates with lights be listed for such use (406.4D). The proposed 2023 NEC seeks to go further on this, with a new section 406.3G, which stems from public input 2907 – also dealing with a public input due to concern about these types of covers. It seems the concern of the submitters is already being addressed in article 406 and as such that this rule is not needed. Putting it in article 406 as it is (where it is just required to be listed) will allow for the product to be used, should it end up passing any needed UL testing.

I am requesting this language be stricken for the reasons of clarity stated above, and for the reason that it is substantiated by a specific concern surrounding receptacles that is being addressed already in article 406.

If the committee should be unwilling to remove this language, the usability and relevance of the code may be improved if this added sentence were moved to the end of the section, and it be rewritten to state that these connections are not allowed unless part of a listed assembly. The current draft has a paragraph of required connection characteristics, then these proposed added prohibited ones, then some more required characteristics – not a user-friendly section of text.

Related Item

• First Revision No. 8556-NFPA 70-2021 [Section No.	• Public Input No. 1510-NFPA 70-2020 [Section No.	• Public Input No. 4639-NFPA 70-2020 [Section No.	• Public Input No. 4091-NFPA 70-2020 [New Section after	• First Revision No. 7603-NFPA 70-2020 [New Section after

110.14(A)]	110.14(A)]	110.14(A)]	406.3(F)]	406.3(F)]

Submitter Information Verification

Submitter Full Name: Josh Weaver
Organization: Josh Weaver
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jul 15 18:02:57 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-7788-NFPA 70-2021

Statement: The deleted text was added by FR 8556. The revision to prevent the use of various types of connection methods may have the unintended consequence of conflicting with established equipment construction specifications. For example, the use of spring type contacts has been used for years in electrical switchgear for applications such as circuit breaker control power and potential transformers connections.

The word “electrical” was added to provide additional clarity about the connection.

CMP-1 considers certification of connection methods for equipment to be covered within the scope of Article 406 under the purview of CMP-18.

Public Comment No. 596-NFPA 70-2021 [Section No. 110.14(A)]

(A) Terminals.

Connection of conductors to terminal parts shall ensure a mechanically secure connection without damaging the conductors and shall be made by means of pressure connectors (including set-screw type), solder lugs, or splices to flexible leads. Terminal connections shall not be made to the drive surfaces of either wire-binding screws or set-screw-type pressure connectors. Terminal connections shall not rely solely upon friction, magnetic, or cantilevered-spring contact with wire-binding screws or set-screw-type pressure connectors. Connection by means of wire-binding screws or studs and nuts that have upturned lugs or the equivalent shall be permitted for 10 AWG or smaller conductors.

Terminals for more than one conductor and terminals used to connect aluminum shall be so identified.

Additional Proposed Changes

File Name	Description	Approved
1_CN_104.pdf	70_CN104	

Statement of Problem and Substantiation for Public Comment

The following CC Note No. 104 appeared in the First Draft Report on First Revisions No. 8556.

The Correlating Committee directs that this first revision be correlated with FR-7564, 406.6(0), which permits the use if specifically evaluated and identified by the receptacle manufacturer. This note will be referred to CMP-18 for information.
The Correlating Committee directs that this first revision Section 110.14(C)(2) be rewritten to comply with the NEC Style Manual, Section 4.1.3 Reference Structure.
The Correlating Committee directs that this first revision Section 110.14(0) be rewritten to comply with the NEC Style Manual, Section 4.1.3 Reference Structure. Informational Notes 2 and 3 need to be revised.

Related Item

• First Revision No. 8556

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 02 11:34:08 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7793-NFPA 70-2021
Statement: The Informational Notes to 110.14(C)(2) and 110.14(D) have been revised to comply with the NEC Style Manual.

Correlating Committee Note No. 104-NFPA 70-2021 [Section No. 110.14(A)]

Submitter Information Verification

Committee: NEC-P01
Submittal Date: Tue May 04 12:01:08 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs that this first revision be correlated with FR-7564, 406.6(D), which permits the use if specifically evaluated and identified by the receptacle manufacturer. This note will be referred to CMP-18 for information.

The Correlating Committee directs that this first revision Section 110.14(C)(2) be rewritten to comply with the NEC Style Manual, Section 4.1.3 Reference Structure.

The Correlating Committee directs that this first revision Section 110.14(D) be rewritten to comply with the NEC Style Manual, Section 4.1.3 Reference Structure. Informational Notes 2 and 3 need to be revised.

First Revision No. 8556-NFPA 70-2021 [Section No. 110.14(A)]

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. 1426-NFPA 70-2021 [Section No. 110.14(B)]

(B) Splices.

Conductors shall be spliced or joined with splicing devices identified for the use or by brazing, welding, or soldering with a fusible metal or alloy. Soldered splices shall first be spliced or joined so as to be mechanically and electrically secure without solder and then be soldered. All splices and joints and the free ends of conductors shall be covered with an insulation equivalent to that of the conductors or with an identified insulating device.

Wire connectors or splicing means installed on conductors for direct burial shall be listed for such use.

Type MV Cable shall be spliced with Type MV Cable Joints or Type MV Terminations.

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.

Type MV Terminations and Type MV Cable Joints were newly defined in Article 315 (Formerly Article 311). The MV Task Group is proposing a modification to Section 110.14(B) to clarify use of the new Type MV Terminations and Type MV Cable Joints.

Related Item

• Global FR 8616

Submitter Information Verification

Submitter Full Name: Robert Osborne
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Fri Aug 13 09:11:13 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: The proposed recommendation that Type MV cable shall be spliced with Type MV cable joints or Type MV terminations has not substantiated why it must be a general requirement and therefore located in Article 110.

Public Comment No. 108-NFPA 70-2021 [Section No. 110.14(C)(1)]

(1) Equipment Provisions.

The determination of termination provisions of equipment shall be based on 110.14(C)(1)(a) or (C)(1)(b). Unless the equipment is listed and marked otherwise, conductor ampacities used in determining equipment termination provisions shall be based on Table 310.16 as appropriately modified by 310.12.

(a) Termination provisions of equipment for circuits rated 100 amperes or less, or marked for 14 AWG through 1 AWG conductors, shall be used only for one of the following:

(2) Conductors rated 60°C (140°F).

(3) Conductors with higher temperature ratings, provided the ampacity of such conductors is determined based on the 60°C (140°F) ampacity of the conductor size used.

(4) Conductors with higher temperature ratings if the equipment is listed and identified for use with such conductors.

(5) For motors marked with design letters B, C, or D, conductors having an insulation rating of 75°C (167°F) or higher shall be permitted to be used, provided the ampacity of such conductors does not exceed the 75°C (167°F) ampacity.

(6) For equipment listed for use with 75 degree C (167 degree F) conductors, conductors having an insulation rating of 75 degree C (167 degree F) or higher shall be permitted to be used, provided the ampacity of such conductors does not exceed the 75 degree C (167 degree F) ampacity

(g) Termination provisions of equipment for circuits rated over 100 amperes, or marked for conductors larger than 1 AWG, shall be used only for one of the following:

(8) Conductors rated 75°C (167°F)

(9) Conductors with higher temperature ratings, provided the ampacity of such conductors does not exceed the 75°C (167°F) ampacity of the conductor size used, or up to their ampacity if the equipment is listed and identified for use with such conductors

Additional Proposed Changes

File Name	Description	Approved
DSCN3131.1575730837820.JPG	50-amp receptacle with 75-degree terminals	
IMG_1197.1575730652360.JPG	30-amp receptacle with 75-degree terminals	
60-75_rated_7.JPG	60-amp breaker with 75 degree C terminals	

Statement of Problem and Substantiation for Public Comment

My Public Input 173 should have been accepted. Perhaps I may not have explained the problem as well as I could have.

Let me rephrase may wording a little.....

For equipment 100-amps or less, there is presently a loophole in the rules explaining how to determine the ampacity of 90 degree C rated conductors, on equipment other than motors, having terminals rated for use with 75 degree C conductors!

110.14(C)(1) (a) allows only 4 choices and specifically states that equipment “shall be used for only ONE of

the following:"
Section 110.14(C)(1)(a)(1) permits 60 degree C conductors.

Section 110.14(C)(1)(a)(2) permits 75 or 90 degree C conductors sized to the 60 degree C ampacity.

Section 110.14(C)(1)(a)(3) permits 75 degree C conductors, but does not specifically permit using 90 degree C conductors sized to the 75 degree C ampacity!

Section 110.14(C)(1)(a)(4) permits 75 or 90 degree C conductors sized to the 75 degree C ampacity, but only applies to motors, and does NOT apply to receptacles, switches, breakers or other equipment! Why not?

Section 110.14(C)(1)(b)(2) addresses this situation for equipment rated over 100-amps. Does heat from current flow not affect 75 degree C terminals of equipment rated less than 100-amps? Of course it does! My proposed wording address this concern.

See photos I submitted showing a 30-amp receptacle, a 50-amp receptacle, and a 60-amp breaker, all of which are rated and marked for use with 75 degree C conductors.

Can we use THHN conductors with this equipment if we determine the conductor ampacity from 75 degree C rating? There is presently no wording that specifically allows this.

While I agree with the Committee statement to PI 173 - "Note that, per 110.14(C), conductors with temperature ratings higher than specified for terminations shall be permitted to be used for ampacity adjustment, correction, or both", there are still many questions that need answers. Of the 4 choices provided by Section 110.14(C)(1)(a), using 90 degree C conductors with their ampacity based on the 75 degree C rating is not presently an option for equipment other than motors.

If the Committee Statement is accurate and complete, what purpose do Sections 110.14(C)(1)(a)(2) and 110.14(C)(1)(a)(4) and 110.14(C)(1)(b)(2) serve then? Are these Sections not needed in the Code?

What if no conductor ampacity adjustments or corrections are needed for ambient temperatures or current-carrying-conductors? How would 110.14(C) be applicable then? Can higher rated conductors still be used in this case? How would their ampacity be determined?

What if ambient temperature corrections are used that actually increase the conductor's ampacity? What then?

Lets look at some examples-

8AWG THHN copper branch circuit wiring installed @ ambient temperature of 59 degree F:

conductor ampacity = [Table 310.16 ampacity] X [Table 310.15(B)(1) correction factor]

55amps x 1.12= 61.6 amps

Is this 8AWG permitted for a 60amp load on 60amp breaker having 75degree C terminals?

Or must we limit the conductor ampacity to that of the 75 degree C ampacity due to 75 degree terminations?

8AWG in 75 degree C column is only rated for 50amps.

Which is it? 50 amps? or 60 amps?
According to the committee's statement, 60-amps seems to be the correct answer.

and yet.....If these same wires were connected to a MOTOR with 75 degree C rated connections, Section 110.14(C)(1)(a)(4) would limit the conductor ampacity to that of 75 degree conductors. What about when the same wires are connected to a breaker or a receptacle with 75 degree terminals? Are the breaker terminals or receptacle terminals not affected by the heating caused by the current flowing? I believe the same heating exists.

Here is another example-
4AWG XHHW aluminum branch circuit installed @95 degree ambient temperature

conductor ampacity = [Table 310.16 ampacity] X [Table 310.15(B)(1) correction factor]

75a X .96= 72-amps

Is this ok for a 70-amp load on a 70-amp breaker having 75 degree C terminals?

4AWG aluminum in 75 degree C column is only rated for 65 amps!!!!!
Will 70 amps of load overheat the 75 degree C terminals?

So, which is it? 65 amps? or 70 amps?
Where is the wording that limits the conductor ampacity to the 75 degree C ampacity? It presently only exists for motors in 110.14(C)(1)(a)(4). What about other equipment?

Here is another example-

2AWG XHHW-2 aluminum feeder conductors installed @ 104 degree F ambient

conductor ampacity = [Table 310.16 ampacity] X [Table 310.15(B)(1) correction factor]

100a x .91= 91 amps

Is this ok for a 91 amp load on a 100amp breaker having 75 degree C terminals?
240.4(B) seems to indicate it would be fine. But what about the 75 degree C terminals?????

2AWG aluminum is only rated for 90 amps in the 75 degree column.

Where is the language requiring the conductor ampacity not exceed that of a 75 degree C wire???? There presently isn't any such wording for equipment other than motors as specified in 110.14(C)(1)(a)(4) or for equipment rated above 100 amps as specified in 110.14(C)(1)(b)(2).

This revision is needed to allow installers to determine conductor ampacity for equipment other than motors in the same fashion that Section 110.14(C)(1)(a)(4) allows for motors and what Section 110.14(C)(1)(b)(2) allows for equipment rated higher than 100 amps.

Note: TerraView would not allow me to insert a "degree" symbol so I was forced to spell the word "degree" instead.

Related Item

• PI 173

Submitter Information Verification

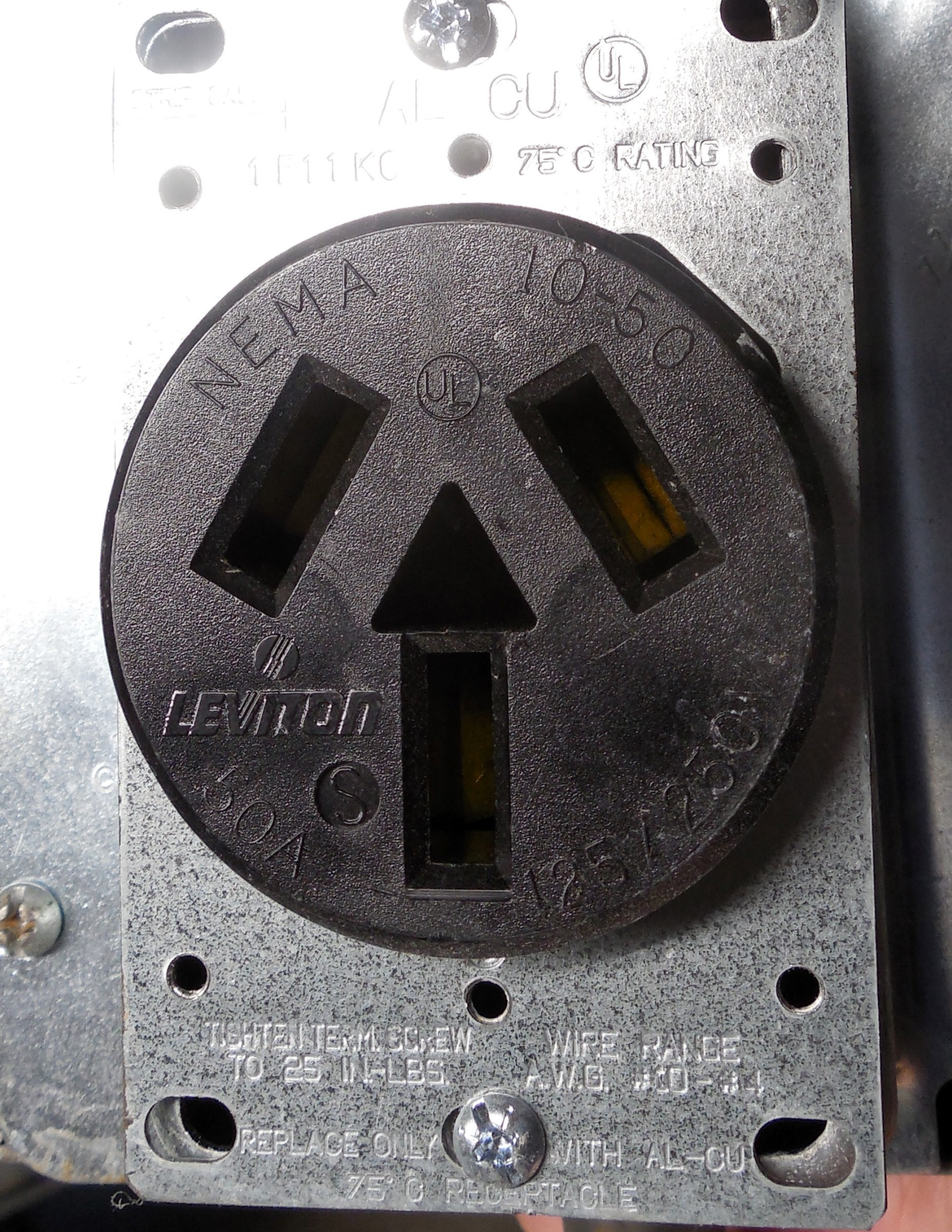
Submitter Full Name: Russ Leblanc
Organization: Leblanc Consulting Services
Street Address:
City:
State:
Zip:
Submittal Date: Sat Jul 03 07:13:57 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: CMP-1 disagrees that there is a loophole as the submitter suggests. The requirement of 110.14(C)(1) which states "Unless the equipment is listed and marked otherwise, conductor ampacities used in determining equipment termination provisions shall be based on Table 310.16 as appropriately modified by 310.12" apply and there is therefore no need to add what the submitter has recommended. Beyond that, 110.14(C)(1)(a) provides other allowances such

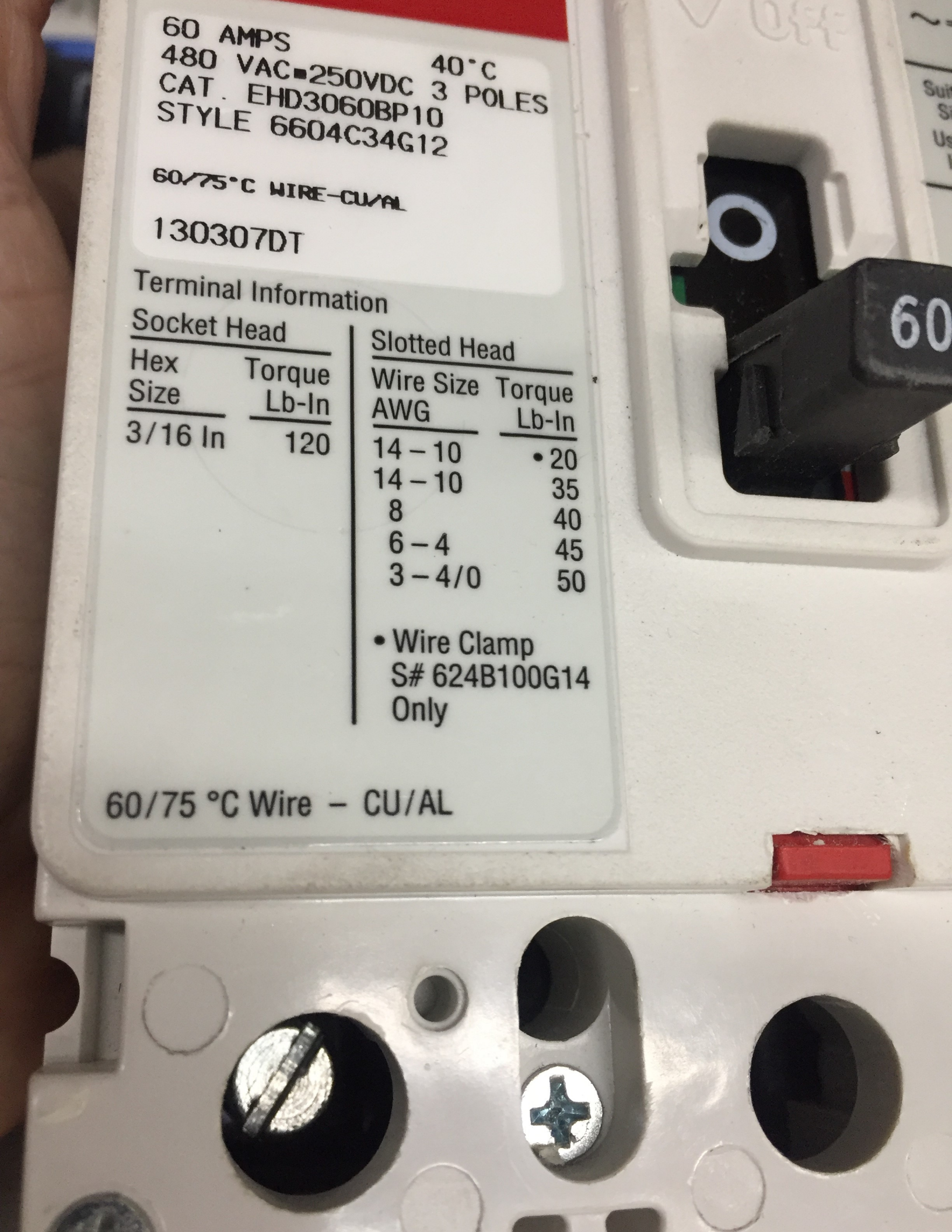
as the following: (a) Termination provisions of equipment for circuits rated 100 amperes or less, or marked for 14 AWG through 1 AWG conductors, shall be used only for one of the following: (1) Conductors rated 60°C (140°F). (2) Conductors with higher temperature ratings, provided the ampacity of such conductors is determined based on the 60°C (140°F) ampacity of the conductor size used. (3) Conductors with higher temperature ratings if the equipment is listed and identified for use with such conductors. CMP-1 further concludes that the submitter did not provide adequate technical substantiation why an additional allowance is justified as proposed. Again, conductors with higher temperature ratings can be used, provided: • Conductors [are] rated 60°C (140°F) • the ampacity of such conductors is determined based on the 60°C (140°F) ampacity of the conductor size used. • the equipment is listed and identified for use with such conductors.


AL CU
75° C RATING
NEMA 10-50
LEVITON
50A 125/250V
TIGHTEN TERM. SCREW TO 25 IN-LBS
WIRE RANGE A.W.G. #10 - #4
REPLACE ONLY WITH AL-CU 75° C RECEPTACLE

NEMA 14-30R

LEVITON

75°C RATING


60 AMPS
480 VAC■250VDC 3 POLES
CAT. EHD3060BP10
STYLE 6604C34G12
60/75°C WIRE-CU/AL
130307DT
Terminal Information
Socket Head
Hex Size
3/16 In
Torque Lb-In
120
Slotted Head
Wire Size AWG
14 – 10
14 – 10
8
6 – 4
3 – 4/0
Torque Lb-In
• 20
35
40
45
50
• Wire Clamp S# 624B100G14 Only
60/75 °C Wire – CU/AL
60

Public Comment No. 194-NFPA 70-2021 [Section No. 110.14(C) [Excluding any Sub-Sections]]

The temperature rating associated with the ampacity of a conductor shall be selected and coordinated so as not to exceed the lowest temperature rating of any connected termination, conductor, or device. Conductors with temperature ratings higher than specified for terminations shall be permitted to be used for ampacity adjustment, correction, or both.

Informational Note: Equipment markings, including terminal temperature ratings, are independent of the circuit conductors. Terminal temperatures are based on product standards and are part of the rating and listing of the equipment. Temperature adjustments or correction factors applied to the circuit conductors does not impact the temperature rating of the equipment or its terminal(s).

Statement of Problem and Substantiation for Public Comment

The panel statement provided on the PI 94 provided much needed clarity on the problem encountered in the field when circuit conductors are adjusted for ambient temperature or other correction factors. The shortened version of the resolution included with this public comment would provide clarity to those that are not involved with the Code process and are not aware of the panel statement. I thank CMP 1 for the clarification on this issue.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 195-NFPA 70-2021 [Section No. 110.40]	

Related Item

• PI 95, Terminal temperature ratings

Submitter Information Verification

Submitter Full Name: Paul Guidry
Organization: Fluor Enterprises, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Sat Jul 10 22:53:10 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: The proposed informational note does not add clarity to the Code. Per 3.1.3 of the NEC Style Manual, informational notes shall only be used where necessary to support or improve usability of the associated requirement. If an Informational note is needed to explain the text of the document, consideration should be given to rewriting the text of the document to make the rule clear.

Public Comment No. 30-NFPA 70-2021 [Section No. 110.14 [Excluding any Sub-Sections]]

Because of different characteristics of dissimilar metals, devices such as pressure terminal or pressure splicing connectors and soldering lugs shall be identified for the material of the conductor and shall be properly installed and used. Conductors of dissimilar metals shall not be intermixed in a terminal or splicing connector where physical contact occurs between dissimilar conductors (such as copper and aluminum or aluminum and copper-clad aluminum), unless the device is identified for the purpose and conditions of use. Materials such as solder, fluxes, inhibitors, and compounds, ~~where employed~~ if used , shall be suitable for the use and shall be of a type that will not adversely affect the conductors, installation, or equipment.

Connectors and terminals for conductors more finely stranded than Class B and Class C stranding as shown in Chapter 9, Table 10, shall be identified for the specific conductor class or classes.

Statement of Problem and Substantiation for Public Comment

This is intended to be an editorial improvement and to bring this sentence into compliance with the NEC Style Manual. "Where" is intended to designate a location and "employed" seems archaic.

Related Item

• PI-3327

Submitter Information Verification

Submitter Full Name: Phil Simmons
Organization: Simmons Electrical Services
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jun 29 21:11:59 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: The use of the term “where” in this context is describing “a situation” (a situation where the materials included in the “such as” statement are employed) and is therefore appropriate. Further, the submitter has not provided adequate substantiation why the term “employed” must be replaced.

Public Comment No. 331-NFPA 70-2021 [Section No. 110.14 [Excluding any Sub-Sections]]

Because of different characteristics of dissimilar metals, devices such as pressure terminal or pressure splicing connectors and soldering lugs shall be identified for the material of the conductor and shall be properly installed and used. Conductors of dissimilar metals shall not be intermixed in a terminal or splicing connector where physical contact occurs between dissimilar conductors (such as copper and aluminum or aluminum and copper-clad aluminum), unless the device is identified for the purpose and conditions of use. Copper and Copper-Clad Aluminum are to be considered similar metals for the application of this requirement. Materials such as solder, fluxes, inhibitors, and compounds, where employed, shall be suitable for the use and shall be of a type that will not adversely affect the conductors, installation, or equipment.

Connectors and terminals for conductors more finely stranded than Class B and Class C stranding as shown in Chapter 9, Table 10, shall be identified for the specific conductor class or classes.

Additional Proposed Changes

File Name	Description	Approved
110.14_PC_1361_SR_8059.pdf	2020 CMP1 Committee Statement, 110.14 Regarding CCA	
Terminal_and_Conductor_Temperature_Testing_Part_I_Fnl.pdf	NFPA Bimetals Task Group Test Reports. CCA Termination with Cu-Only Splice Connectors. Static Heating	
Term_and_Cond_Temp_Thermocycling_Report_Part_II_w_Append.pdf	NFPA Bimetals Task Group Test Reports. CCA Termination with Cu-Only Splice Connectors. Cyclical Testing	

Statement of Problem and Substantiation for Public Comment

This PC attempts to clarify that Copper and Copper-Clad Aluminum are similar metals for the application of this requirement. The intention of CMP1 is to convey that CCA and Cu are similar metals. The current text, however, uses presumptive logic that falls short of stating that CCA and Cu are similar metals. For example, the current text states that CCA and Aluminum are dissimilar metals, but mentions nothing about CCA and copper being Similar. The resulting text of section 110.14 leaves too much for interpretation. The user is left to infer that CCA and Cu are similar.

The committee statement from the 2020 cycle on section 110.14 from SR 8059 clearly states that CCA and Cu should be treated as similar metals. Note: "Copper and copper-clad aluminum have been deleted from the dissimilar metal list for the application of this requirement." See attachment of SR 8059.

Whenever possible, all inferences should be removed from any text for use in codes, standards and technical writing. If an inference is not removed, it leaves room for the reader to draw the wrong conclusion. The proposed text of this PC 331 makes the point clear that Cu and CCA are similar metals. It removes the inference. It accomplishes the intention of the panel in a clear and direct manner.

Despite the guidance given by UL 486, CCA wire has terminated with copper-only terminals and splice connectors for its entire 1/2 century of existence. UL 486 will be updated over the next 18 months to reflect the reality that CCA and copper terminate safely together, as was originally designed, while using the same

connectors and terminals. The copper cladding process creates a metallurgical bond between the two metals. The copper cladding process effectively removes the insulating aluminum oxide surface layer endemic to single-metal aluminum. The insulating oxide layer of aluminum is replaced by a thick layer of high purity copper, oxygen-free grade copper. A full 27% of the wire's mass is copper. The attached NFPA Bimetals Task Group Reports state that CCA puts out on average 68% less heat at points of splice connection and termination (to circuit breakers and wiring devices) at its full ampacity rating than copper at its full ampacity rating. This data is both ground-breaking and significant. This is a testament to the highly conductive surfaces of CCA, which are 100% oxygen-free copper.

Related Item

• PI 3618

Submitter Information Verification

Submitter Full Name: Peter Graser
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City:
State:
Zip:
Submittal Date: Fri Jul 23 08:11:57 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-7690-NFPA 70-2021 While the statement that copper and copper-clad aluminum are considered similar metals, this will cause confusion without proper context. Terminals are only suitable for use with copper-clad aluminum conductors if they have been evaluated for both copper and aluminum. The proposed text implies that terminals suitable for copper are also suitable for copper-clad aluminum.

Statement: The parenthetical phrase is being deleted to comply with 3.3.1.2 of the NEC Style Manual which states, in part, to “[u]se simple declarative sentence structure and keep sentences short. Writing rules in long sentences full of commas, dependent clauses, and parenthetical expressions often creates confusion and misunderstanding. The requirement can be written in two or more short sentences, expressed using a list or table, or both.”

Terminal and Conductor Temperature Testing of 14 AWG Copper-Clad Aluminum and 14 AWG Copper Conductors

Part I – Static Heating and Flexing Tests

For

Bimetallics Task Group

Conducted at

Eaton Laboratories
Menomonee Falls, Wisconsin

Report by

Chuck Mello
on behalf of Bimetallics Task Group

Report Date

August 28, 2020

Table of Contents

Appendices

1.0 Introduction and Purpose

At the direction of the NFPA Standards Council in their Decisions D#19-2 and D#19-23, a Bimetallics Task Group of balanced interest was appointed. The scope was to review the proposed changes to the 2020 edition of the *NEC*® that relate to copper-clad aluminum conductors and recommend changes through tentative interim amendment(s) and/or to provide public inputs for the next revision cycle.

As the task group conducted the work, it was determined that testing data had been provided substantiating the ampacity of 14 AWG copper-clad aluminum but a number of related questions about 14 AWG copper-clad aluminum applications arose regarding terminal temperatures when applied to circuit breakers, wire splicing devices and device terminals. A testing plan was developed, reviewed over several task group meetings, and accepted by the task group to address the terminal temperature questions. This testing was completed at the Eaton Corporation laboratory facilities in Menomonee Falls, Wisconsin. The helpful assistance of Mr. Tom Domitrovich, Mr. Kevin Arnold, Mr. James Parrett, and Mr. Steve Averbeck with Eaton Corporation is greatly appreciated in arranging for and executing the testing.

This test report provides the testing arrangement, testing procedures and results for the static heating and the flexing tests. The Part I testing detailed in this report commenced July 30, 2020 and completed on August 26, 2020. Thermocycling testing is presently being conducted and those test results will be provided in a separate report. The separation of the reports is necessary to meet the NFPA deadline of September 10, 2020 to submit public inputs and any supporting data.

The purpose of this testing is to provide data, as requested by the Bimetallics Task Group, to understand certain installation and operating conditions when considering the application of 14 AWG copper-clad aluminum conductors at the proposed ampacity for branch circuits. The testing being completed also includes 14 AWG copper conductors at its *NEC*® ampacity for comparison and performance. The basis for comparison is at the 60ºC ampacity rating for copper (15 amps) and the proposed 60ºC ampacity rating for copper-clad aluminum (10 amps). This testing is designed to represent a typical installation to determine the following:

1) The temperature (temperature rise) on the terminals and conductor immediately adjacent to a 10 Amp and 15 Amp molded case circuit breaker, under normal and identified abnormal conditions
2) The temperature (temperature rise) on wire-splicing devices (e.g., Ideal Wire Nuts® or similar), and conductor immediately adjacent, commonly used for splicing in junction or device boxes or attaching leads from utilization equipment, under normal and abnormal conditions
3) The temperature (temperature rise) on wiring devices (single receptacle as representative) and conductor immediately adjacent under normal and abnormal conditions
4) Conductor retention on wiring devices after abnormal thermal-cycling
5) The flexing durability of 14 AWG copper-clad aluminum when installed and removed from a single-gang device box

Since the various product standards do not presently have requirements, procedures or parameters for 14 AWG copper-clad aluminum, the testing being conducted is based on the 10-ampere branch circuit rating at 60°C and percentage multipliers taken from the applicable standards. Where the standard does not provide a percentage value, then the current for the testing was interpolated from the values for relative copper and/or aluminum conductors from the standard. The values for testing of 14 AWG copper are taken from the applicable product safety standards with an ampacity basis of 15 Amps at 60°C

It is to be understood this testing is only being conducted to provide specific performance data and information as requested by the task group. The testing does not provide performance or data for certification of any of the components used for the testing. If 14 AWG copper-clad aluminum is accepted into the 2023 *NEC*®, then numerous UL standards will need to be revised and testing completed under the requirements established in those standards. This testing for certification could be more extensive and take much more time to complete than what is provided here. The goal again is to provide information for a typical installation specific to terminal temperatures. The changes to UL standards will not begin to occur until 14 AWG copper-clad aluminum is recognized for installation in the *NEC*®.

To provide a basis to consider the test results for 14 AWG copper-clad aluminum, duplicate test set ups were constructed using 14 AWG copper conductors. The only difference in the setup for 14 AWG copper is the circuit breaker was rated 15 Amps and the testing values were based on the 15 Amp ampacity. This additional testing data provides a direct comparison in the same environment at the 60ºC ampacity values for these two conductor types and assemblies.

2.0 Testing Arrangement and Setup

The test was conducted in a suitable facility with environmental controls and documented monitoring. The facility was free from extraneous changes in ambient temperature and from having random air flow (drafts) through the testing area. Ambient temperature was maintained between 20ºC and 25°C and recorded with thermocouples positioned in the testing area while temperature testing was completed.

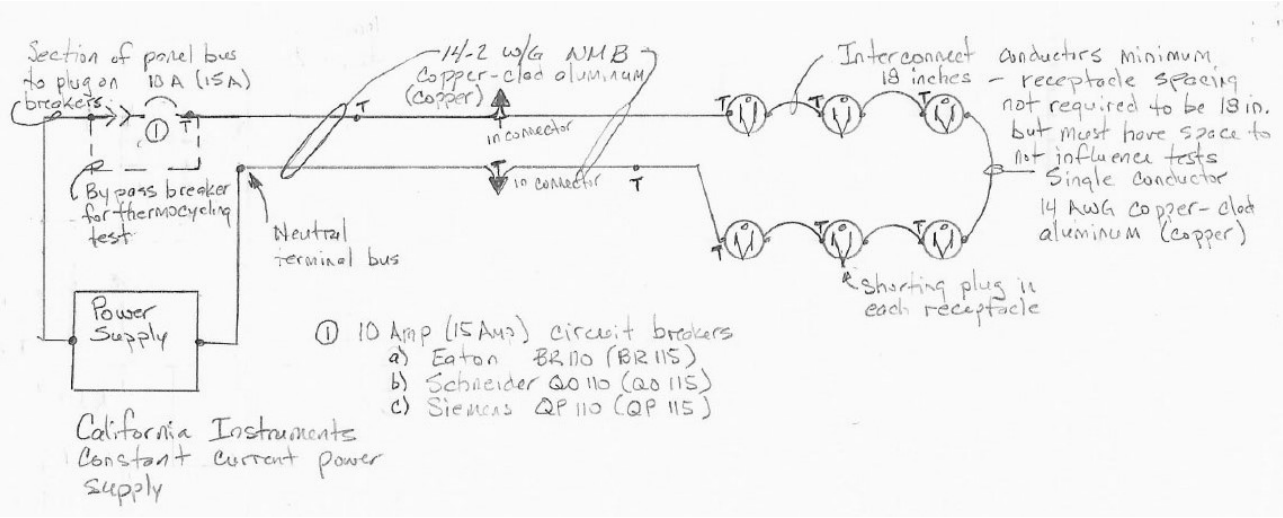


Figure 1 – Typical Test Circuit Diagram

The Eaton facility, being a division within a manufacturing company of wiring devices and circuit breakers, has laboratory technicians that are very familiar with testing of circuit components and equipment to UL standards.

The test circuit diagram shown in figure 1 above provides the basic layout of one (1) testing circuit consisting of one (1) circuit breaker, the conductor (14 AWG copper-clad aluminum or copper NM-B cable) two wire-splicing devices, and six (6) single receptacles. To complete tests 1 through 4 as described below, three (3) of these test circuits were assembled at a time. Photos 1 through 3 in Appendix A show the general test setup for completing the static heating testing. Each of the three (3) circuits have one of the manufacturer's (mfg. 1, mfg. 2, and mfg. 3) circuit breaker, the wire splicing devices on the black and white wire as described below, and three (3) each of receptacles from two of the manufacturers. Photos 4 through 7 show each of the setups with a sign indicating the circuit breaker, conductor material, wire splicing devices, and receptacles in that circuit.

For example, a setup had three (3) circuits with:

- Three different 10-amp circuit breakers (one each mfg. 1, mfg. 2, and mfg. 3)
- 14 AWG copper-clad aluminum NM-B conductors
- Mfg. 4 and mfg.5 wire splicing devices respectively, on the black and white conductors
- Three each of the mfg. 8 and mfg. 9 receptacles, and
- 14 AWG THHN copper-clad aluminum conductors for interconnection of the receptacles

These components were connected together to form a complete circuit. The second setup for 14 AWG copper-clad aluminum were same circuit breakers but with mfg.6 and mfg.7 wire spicing devices and with mfg. 10 and mfg.11 receptacles. The third and fourth setups were the same as 1 and 2 except using 15-amp circuit breakers and 14 AWG copper conductors.

Due to testing of several different circuit breakers, receptacles, and wire-splicing devices, the test arrangement was different than what may be used for certification testing of a single type of device. The test purpose was to approximate an actual installation under laboratory type conditions and not to establish certification type testing for any one device.

For tests 1 through 4 the three power supplies used were programmable constant current power supply sources. Each power supply was connected to one of the circuits and provided the current level specified for the tests being conducted.

For each of the four setups the following description is provided, see circuit diagram in figure 1 and Appendix A photos 1 through 7:

1) The three (3) circuits were mounted on an insulating sheet approximately 4 feet high and 8 feet wide. The partition had suitable framing to provide structural support for the partition to be in a vertical orientation to the floor.

2) During all testing, suitable barrier tape, safety cones, barriers, or other means was in place in accordance with the laboratory safety procedures to keep unauthorized persons out of the area and away from exposed live parts.

3) The individual conductors and devices were arranged horizontally with approximately 12 inches of vertical spacing between each horizontal assembly. Staples, or other fastening devices, such as cable ties, were used to keep the NM-B cable aligned with the respective test assembly.

4) For the circuit breaker testing the following was assembled:

   a) For the copper-clad aluminum conductors, three (3) 10-amp plug-on type panelboard circuit breakers were installed on sections of panelboard bus that are mounted onto the insulating board partition.

   b) For the copper conductors, three (3) 15-amp plug-on type panelboard circuit breakers were installed on sections of panelboard bus that are mounted onto the insulating board partition. The panelboard bus had a terminal for connection of one conductor from the power supply.

5) From the circuit breaker approximately 4 feet of 14-2 NM-B cable was installed and supported as provided above. From this center junction another 2 feet of 14-2 NM-B cable (copper-clad aluminum or copper as applicable) was installed. The junction in the middle had approximately 6 inches of exposed conductor and a splice completed with yellow wire-splicing devices as provided for the black, white and equipment grounding conductors. The following was applied to the two setups for the copper-clad aluminum conductors respectfully and repeated for the copper conductor setups.

   a) The black wire for the first circuit set of three used a mfg. 4 yellow wire-splicing devices

   b) The white wire for the first circuit set of three used an mfg. 5 yellow Wire Nuts®

   c) The black wire of the second circuit set of three used a mfg. 6 yellow wire-splicing devices

   d) The white wire of the second circuit set of three used a mfg. 7 yellow wire-splicing devices

   The manufacturer and location of the wire-splicing devices used was recorded for each test setup.

6) Six (6) receptacles were installed at the end of each horizontal assembly.

   a) The first set of circuits of copper-clad aluminum or of copper had three (3) mfg. 11 receptacles and then three (3) receptacles from mfg. 8 all connected in series.

   b) The second circuit of copper-clad aluminum or of copper had three (3) receptacles from mfg. 10 and then three (3) receptacles from mfg. 9 all connected in series.

   The receptacles were spaced a minimum of six (6) inches apart horizontally and/or vertically and were interconnected with a minimum of eighteen (18) inches of 14 AWG solid THHN copper-clad aluminum or copper conductors respectfully.

   The receptacles were mounted to the wall surface with screws, so that the face of the receptacle was approximately 1 1/2 inches from the insulating board partition surface.

   For each manufacturer the receptacles were connected to terminals as follows:

   a) One receptacle had the conductors installed at each wire binding screw and the conductors were wrapped counter-clockwise around the screw shank under the screw head, for 2/3 to 3/4 of wire binding screw circumference.

b) The second receptacle had the conductors installed into one side back terminal (entry hole) of the pressure plate terminal.

c) The third receptacle had two conductors installed into each back-side pressure plate terminal as follows: one conductor of the test circuit into each side (hot and neutral) of the pressure plate terminal and one additional short conductor of equal diameter and material into the other side (entry hole) of the same pressure plate terminal. The second conductor was to fill the slot only and is not required for any other purpose than to balance the mechanical clamping forces applied.

Each receptacle had a shorting plug installed as follows:

a) The ungrounded (BLACK) and grounded (WHITE) contacts of each receptacle being tested were connected together by a mated attachment plug having rigidly-attached solid blades.

b) The terminals of each attachment plug were short-circuited by the shortest feasible length of 14 AWG stranded copper conductor from type SJ flexible cord.

c) The flexible cord shorting conductor was mechanically terminated into the pressure plate terminals and the connection torqued to the manufacturer's specification.

7) The conductor from the neutral terminal of the last receptacle in the series was routed back using the white wire in the NM-B cable, through the wire-splicing devices and terminated at a terminal bar mounted to the support board for connection back to the power supply.

8) All connections were tightened as follows. Torquing tools were calibrated and calibration documented:

a) The circuit breaker terminals were torqued as specified on the circuit breaker nameplate.

b) The wire-splicing devices were torqued to the manufacturer's specification in the instructions. If there was no specification, then the 14 AWG copper-clad aluminum conductors were torqued to 2.47 lbf-in and the 14 AWG coper conductors were torqued to 4.11 lbf-in [Specification from UL 486C – 9.1.9.4]

c) The terminals of the receptacles and of the attachment plugs were torqued to the manufacturer's specification in the installation instructions. If there was no torque specification provided, then the terminals were torqued to 9 lbf-in.

9) Thermocouples were connected as shown in the diagram, figure 1 and as shown in Appendix A photos 8 and 11 through 14.

a) Thermocouples were installed on device terminals so that it did not interfere with the terminal.

For the wire-splicing devices, the thermocouples were attached into the wire bundle within the wire-splicing devices.

b) The thermocouples that measured center wire temperatures had a flap of the NM-B jacket and the conductor insulation peeled back to expose the conductor. The thermocouple was attached with thermo-cement to the conductor and the conductor insulation and jacket flap folded back to the original position with two wraps of black electrical tape wrapped to hold the flap in place.

c) A thermocouple was positioned midway in elevation to the test setup for each circuit and recorded the ambient temperature as testing was completed.

10) The power supply was a programable constant current power supply. The current was monitored and recorded by the data logger along with the temperature recordings. The power supply was connected to the lug on the panelboard bus serving the circuit breaker and to the neutral terminal bar where the return white conductor from the NM-B cable was terminated.

3.0 Materials for Testing

The generous support with the supplying of materials by Copperweld, Eaton, Hubbell, Legrand, Leviton, and Siemens are acknowledged and appreciated. The following materials were used to complete the setups as described above.

1) The circuit breakers for the copper-clad aluminum testing were single pole 10 Amp 120/240 Volt, 10,000 interrupting rating with five (5) each of the following (two (2) breakers to be used and the others as backup):
   a) Eaton BR110,
   b) Schneider QO110, and
   c) Siemens QP110.
2) The circuit breakers for the copper testing were single pole 15 Amp 120/240 Volt, 10,000 interrupting rating with five (5) each of the following (two (2) breakers to be used and the others as backup):
   a) Eaton BR115,
   b) Schneider QO115, and
   c) Siemens QP115.
3) The yellow wire-splicing devices were as follows:
   a) Gardner-Bender Ultra WingGard
   b) Ideal Wing-Twist
   c) 3M Performance Plus Red/Yellow+
   d) Commercial Electric WT4

4) The receptacles for both the copper-clad aluminum and copper testing were:
    a) Eaton (Cooper) model TR6250W, 5-15R single receptacle with wire binding screw and pressure plate terminals (back and side wired)
    b) Hubbell model HBL 5261, 5-15R single receptacle with both wire binding screw and pressure plate terminals (back and side wired)
    c) Legrand (Pass & Seymour) model TR 5251, 5-15R single receptacle with both wire binding screw and pressure plate terminals (back and side wired)
    d) Leviton model T 5015, 5-15R single receptacle with both wire binding screw and pressure plate terminals (back and side wired)
5) Thermocouples, UL calibrated, model UL 3055, with sufficient length to connect and route to datalogger recording device.
6) Datalogger recording device and laptop or another required device for the datalogger.
7) Programable power supplies from Eaton laboratory. Maximum current for the copper was 30 Amps and for the copper-clad aluminum was 20 amps.
8) Approximately 50 feet each of 14-2 w/ground copper-clad aluminum NM-B cable and of 14-2 w/ground copper NM-B cable.
9) Approximately 50 feet each of 14 AWG solid THHN copper-clad aluminum and 14 AWG solid THHN copper single conductors.

4.0 Test Procedures

4.1 Conductor Material Testing

A sample of each the 14-2 NM-B and 14 AWG THHN copper-clad aluminum conductors used for the testing was returned to the Copperweld factory laboratory for analysis. The testing was performed to confirm the conductors that were used for the testing at Eaton were in fact 14 AWG and met the requirements for copper-clad aluminum as specified in UL 83 Annex E and ASTM B566. The packaging was photo documented from the Eaton laboratory and the opening of the package at the Copperweld laboratory photo documented.

The Copperweld laboratory technician, who routinely performs the full ASTM B566 battery of testing, completed all the testing and documented it on a Copperweld laboratory test data sheet.

Standard materials testing was completed by Copperweld laboratory technicians including:

- DC resistance
- Copper thickness
- Copper Volume
- Tensile strength
- Elongation
- Adhesion
- Cohesion

The following tests, as completed by the Copperweld laboratory technician, were witnessed and documented by the UL Field Representative that normally completes follow-up inspections of copper-clad aluminum conductors as part of the recognized component program, under category DVVU2:

- DC resistance
- Copper thickness
- Tensile strength
- Elongation

4.2 Terminal Temperature Testing

The following test procedures, except the flexing test, used references from parts of UL 486(A)(B); UL 486(C); UL 489; UL 20; and UL 498.

As stated, the tests 1 through 4 were completed with all three (3) manufacturer's circuit breakers in three circuits at one time. These tests are identified with the test number from below with an "a", "b" or "c' representing the representative circuit breaker used:

a. mfg. 1 circuit breaker

b. mfg. 2 circuit breaker

c. mfg. 3 circuit breaker

This same nomenclature is used in the data sheets found in Appendix C. To minimize test setups, and the number of times terminations are completed or taken apart, all four (4) static heating tests were completed for the "a", "b", and "c" circuit setups. After these tests were completed, then the next setup was assembled by changing the wire splicing devices and receptacles or changing the conductors from copper-clad aluminum to copper as applicable.

All static heating tests, tests 1 through 4 commenced with all components at ambient temperature.

For all testing temperature equilibrium is three consecutive readings taken at no less than 5-minute intervals indicating no further rise in temperature above the ambient temperature. For tests where the circuit breaker trips, which may be before temperature equilibrium was attained, the last three recorded temperatures were recorded onto the data sheets.

Test #1 – Rated Current Temperature

Each circuit was operated at 100% of the branch circuit rating (CCA - 10 Amps or Cu - 15 Amps) until temperature equilibrium was achieved. The final temperatures were recorded. All terminations were inspected for evidence of thermal damage. Temperature measurements were recorded at one-minute intervals.

Test #2 – Circuit Breaker Overload Temperature

Each circuit was operated at 135% of the branch circuit rating (CCA - 13.5 Amps or CU - 20.25 Amps) until temperature equilibrium was achieved or the circuit breaker tripped whichever came first. The circuit breaker elapsed trip time was recorded. Table 1, in section 4.3 below, provides the expected circuit breaker trip times from the manufacturer's time current curves. If the circuit breaker tripped, the last three recorded temperatures of the conductor, wire-splicing devices and wiring device were recorded on the datasheet. All terminations were inspected for evidence of thermal damage. Temperature measurements were recorded at 20-second intervals.

Test #3 – Wiring Device Overload Temperature

Each circuit was operated at 150% of the branch circuit rating (CCA - 15 Amps, or CU - 22.5 Amps) until temperature equilibrium was achieved or the circuit breaker tripped whichever came first. The circuit breaker elapsed trip time was recorded. Expected circuit breaker trip times are in a table 1 below in section 4.3 of procedure. If the circuit breaker tripped, the last three recorded temperatures of the conductor, wire-splicing devices and wiring device were recorded on the datasheet. All terminations were inspected for evidence of thermal damage. Temperature measurements were recorded at 10 second intervals.

Test #4 – Circuit Breaker Overload Temperature

Each circuit was operated at 200% of the branch circuit rating (CCA - 20 Amps, or CU 30 Amps) until temperature equilibrium was achieved or the circuit breaker trip tripped whichever came first. The circuit breaker elapsed trip time was recorded. Expected circuit breaker trip times are in a table 1 below in section 4.3 of procedure. If the circuit breaker tripped, the last three recorded temperatures of the conductor, wire-splicing devices and wiring device were recorded on the datasheet. All terminations were inspected for evidence of thermal damage. Temperature measurements were recorded at 7 second intervals.

Test #5 – Wiring Device Thermal Cycling

The thermocycling testing is underway at the time this report is being written. In order to meet NFPA public input deadlines, this report is for all testing completed at this time. A subsequent report will be written for the thermocycling testing.

Test # 6 – Conductor Flexing Test

a) A standard 2 x 3 device box was mounted to a wood stud fixed to a table for support. See Appendix A photo 15. The device box was mounted with screws through the back of the box.

b) A length of 14-2 AWG copper-clad aluminum NM-B cable was installed into the device box using NM cable clamps. The NM-B had a minimum of 1/4 inch of cable jacket projecting into the box past the clamping device.

c) The outside end of the NM-B cable was connected to a digital multimeter to indicate continuity of the circuit through the receptacle, see Appendix A photo 16.

d) The NM-B cable jacket was stripped and cut to length so that 6 inches of conductor projected beyond the cable entry to the box and 3 inches beyond the front edge of the device box. A receptacle was terminated to the NM-B cable conductors and the conductors shaped to fit back in the box so the receptacle yoke mated with the box front edge.

e) For the first test, the NM-B conductors were installed using the wire binding screw with the conductors wrapped counter-clockwise around the screw shank under the screw head, for 2/3 to 3/4 of wire binding screw circumference.

f) A shorting plug was installed into the receptacle.

g) The 6-32 screws were removed and approximately 4-inch-long 10-32 screws were fixed to the device box ears and through the yoke of the receptacle providing a guideway for repeated insertion and removal. The 10-32 screws had nuts installed in the inside and outside of the device box ears to make rigid to the box, see Appendix A photo 15.

h) With the assembly complete, the receptacle was pushed into and retracted from the box for 10 cycles and the continuity monitored on the digital multimeter, see Appendix A photos 17 through 19.

i) Steps ‘b’ through ‘h’ were repeated two more times with new lengths of 14-2 NM-B copper-clad aluminum cable.

- For the second test the receptacle was assembled with the back-wiring pressure plate terminal and a single conductor.
- For the third test the receptacle was assembled with the back-wiring pressure plate terminal and two conductors for mechanical balance on the wiring terminal.

4.3 Bimetallics Testing Circuit Breaker Trip Times

The below table provides the expected trip times based on the manufacturers time current curves at 40°C. The testing for this project was completed at about 22°C, based on the ambient temperatures recorded. Therefore, the trip times recorded from this testing may be somewhat higher but should not exceed the limits set in the UL Standard.

The UL standard specifies that calibration testing be competed at an ambient temperature of 25°C. The UL standard calibration testing at 25°C specifies that at:

- 135% of rating the maximum trip time for a 0 - 50-amp circuit breaker is 1 hour
- 200% of rating the maximum trip time for a breaker 0 – 30 amps is 2 minutes.

Table 1

Manufacturer	Catalog No.	Trip Time Range in Seconds @ 40°C			
		100% rated current	135% rated current	150% rated current	200% rated current
Eaton	BR110	No trip	35 - 3600	20 - 500	12 - 40
	BR115	No trip	35 - 3600	20 - 500	12 - 40
Schneider	QO110	No trip	40 - 500	26 - 240	10 - 60
	QO115	No trip	30 - 210	21 - 100	8 - 28
Siemens	QP110	No trip	60 -800	40 - 450	19 - 150
	QP115	No trip	30 - 250	20 - 100	9 - 38

5.0 Test Results

5.1 Copper-Clad Aluminum Conductor Material Testing

After the static heating testing was completed, Eaton laboratory technicians packed and shipped samples of the copper-clad aluminum conductor, NM-B cable and THHN single conductor, that had been used for the testing to Copperweld's laboratory for verification testing. Appendix A photos 22 to 24 show the samples the Eaton laboratory technicians packaged into the bag and shipped to the Copperweld laboratory. Note the date on these photos as August 24, 2020. Appendix B pages B1 and B2 show photos of the received package and opening of that package with these samples for the testing.

The samples of the 14 AWG copper-clad aluminum NM-B cable and the 14 AWG copper-clad aluminum THHN single conductors were tested in the Copperweld factory laboratory on August 27, 2020. The Copperweld laboratory testing data is provided in Appendix B page B3 and the calibration of the test equipment on pages B4 through B6.

The UL field engineer that routinely completes the quarterly follow-up inspections for the copper-clad aluminum conductor witnessed the testing required under the UL standard follow-up program that was completed on August 27, 2020. As shown in Appendix B, page B7, the UL field engineer confirmed that "*the 14 Awg from the NMB and THHN samples passed the UL tests for DVVUs, including Tensile, Elongation, copper thickness and DC resistance"*

The test results for the copper-clad aluminum confirm that the conductors used for this testing were 14 AWG and that the material tested met the requirements in ASTM B566.

5.2 Test Setup and Torquing

The test setups were as described in Section 2.0 of this report and shown with photographs in Appendix A. The terminations were tightened to the applicable torque value with a calibrated torque wrench. For the static heating testing the following tables show the torque values applied for each setup and device terminal.

Copper-Clad Aluminum conductors with mfg. 11 and mfg. 8 Receptacles

Torques applied:

Item being torqued	in/lbs	mfr. spec	default
mfg. 1 brkr	20	yes	no
mfg. 2 brkr	36	yes	no
mfg. 3 brkr	25	yes	no
mfg. 4 wire splicing device	2.47	no	yes
mfg. 5 wire splicing device	2.47	no	yes
mfg. 11 receptacles	9	no	yes
mfg. 8 receptacles	12	yes	no

Copper-Clad Aluminum conductors with mfg. 10 and mfg. 9 Receptacles

Torques applied:

Item being torqued	in/lbs	mfr. spec	default
mfg. 1 brkr	20	yes	no
mfg. 2 brkr	36	yes	no
mfg. 3 brkr	25	yes	no
mfg. 6wire splicing device	2.47	no	yes
mfg. 7 wire splicing device	2.47	no	yes
mfg. 10 receptacles	9	no	yes
mfg. 9 receptacles	9	no	yes

Copper conductors with mfg. 11 and mfg. 8 Receptacles

Torques applied:

Item being torqued	in/lbs	mfr. spec	default
mfg. 1 brkr	20	yes	no
mfg. 2 brkr	36	yes	no
mfg. 3 brkr	25	yes	no
mfg. 4 wire splicing device	4.11	no	yes
mfg. 5 wire splicing device	4.11	no	yes
mfg. 11 receptacle	9	no	yes
mfg. 8 receptacle	12	yes	no

Copper conductors with mfg. 10 and mfg. 9 Receptacles

Torques applied:

Item being torqued	in/lbs	mfr. spec	default
mfg. 1 brkr	20	yes	no
mfg. 2 brkr	36	yes	no
mfg. 3 brkr	25	yes	no
mfg. 6wire splicing device	4.11	no	yes
mfg. 7 wire splicing device	4.11	no	yes
mfg. 10 receptacle	9	no	yes
mfg. 9 receptacle	9	no	yes

5.3 Static Heating Test

The following are the results of the static heating testing, tests 1 through 4 with references to the applicable appendix pages. For all the testing data, the final three recorded temperature values are shown at either temperature equilibrium or the final three temperatures recorded before a circuit breaker tripped. All testing commenced with all test measurement points at ambient temperature. Also shown in the tables in the appendix are:

- The elapsed time from the start of the test,
- The ambient temperature recorded at the time of the recorded values, and
- The current at the time of the recorded values.

Since the UL standards reference temperature rise for most of the devices, those calculated values are shown immediately adjacent to the recorded values. The temperature rise was calculated by taking the recorded temperature and subtracting the ambient temperature recorded for that time.

Since the method of termination on each the three receptacles from one manufacturer was different (wire binding screw, back wired with pressure plate with one conductor and back wired with pressure plate with two conductors) exact data comparison of terminal temperature needs to be done line by line. For example, from appendix page C1 – 1, the line 1a for copper-clad aluminum, top table, needs to compare with line 1a for copper, bottom table.

Otherwise, data in general for terminal temperatures of specific devices, circuit breakers, wire splicing devices and receptacles as well as the conductor, can be compared in general. To facilitate ease of comparison, the pages in appendices C1 though C4 have been arranged so that each page has the copper-clad aluminum data in the top table and the related copper data in the bottom table.

5.3.1 Static Heating at 100% Rated Current

The data for the static heating testing at 100 percent of rated current are shown in Appendix C1. The recorded values are all after the temperatures being recorded had achieved temperature equilibrium. As can be seen in line by line or with general comparisons, the terminal and conductor temperatures for the copper-clad aluminum were less than those recorded for copper when operating at rated current. All temperatures recorded were less than the allowances in the applicable UL standards.

5.3.2 Static Heating at 135% Rated Current

The data for the static heating testing at 135 percent of rated current are shown in Appendix C2. The 135 percent current level is a calibration point for circuit breakers, rated up to 50 amps, where they are required to trip within 1 hour. The recorded values are the last three recorded temperatures before the circuit breaker tripped.

In doing analysis consideration must be given to the fact the temperatures recorded were still rising when the circuit breaker tripped. Therefore, when doing line by line or general comparisons, the circuit breaker trip time must be considered. It is noted the mfg. 1 10-amp circuit breaker tripped approximately twice as fast as the 15-amp circuit breaker, 8 vs. 19 seconds, and this resulted in higher recorded temperatures for copper. The test results with the mfg. 2 circuit breakers was reversed with the 15-amp breaker tripping in approximately half the time of the 10-amp circuit breaker, 3.5 vs. 5.5 seconds. Even with this time disparity the copper-clad aluminum with the longer time recorded lower temperatures than the copper. The trip times for the mfg. 3 circuit breakers had the 10-amp breaker tripping 3 times longer than the 15-amp breaker, but the copper-clad aluminum terminal temperatures still were less than or near to the copper terminal temperatures.

All temperatures recorded were less than the allowances in the applicable UL standards.

5.3.3 Static Heating at 150% Rated Current

The data for the static heating testing at 150 percent of rated current are shown in Appendix C3. The 150 percent current level is a static heating test current for wiring devices. The recorded values are the last three recorded temperatures before the circuit breaker tripped.

In doing analysis consideration must be given to the fact the temperatures recorded were still rising when the circuit breaker tripped. Therefore, when doing line by line or general comparisons, the circuit breaker trip time must be considered. The test data results shown in appendix C3 generally follow that same pattern as occurred with the 135 percent testing.

All temperatures recorded were less than the allowances in the applicable UL standards.

5.3.4 Static Heating at 200% Rated Current

The data for the static heating testing at 200 percent of rated current are shown in Appendix C4. The 200 percent current level is a calibration point for circuit breakers, rated up to 30 amps, where they are required to trip within 2 minutes. The recorded values are the last three recorded temperatures before the circuit breaker tripped.

In doing analysis consideration must be given to the fact the temperatures recorded were still rising when the circuit breaker tripped. Therefore, when doing line by line or general comparisons, the circuit breaker trip time must be considered. The test data results shown in appendix C4 generally follows the same pattern as occurred with the 135 percent and 150 percent testing.

All temperatures recorded were less than the allowances in the applicable UL standards.

5.3.5 Static Heating at 135% Rated Current – Circuit Breaker Did Not Trip

The first attempt at the 135 percent testing found the mfg. 2 10-amp circuit breaker not to trip within the required 1-hour time. The data for this static heating test at 100 percent and at 135 percent of rated current are shown in Appendix C5. The top table on this appendix page is the 100 percent test data and the bottom table is the 135 percent test data. As stated before, the 135 percent current level is a calibration point for circuit breakers, rated up to 50 amps, where they are required to trip within 1 hour.

Since the circuit breaker failed to trip the test was stopped shortly after the 1-hour time had elapsed. Analysis of the 135 percent data recorded found that after 1-hour at this current level, above the proposed rated current, none of the terminal or conductor temperatures had risen above UL standards allowances.

5.3.6 Flexing Tests

The data for the flexing testing is shown in Appendix D. There is no UL or other known industry standard for this specific test and the test process used was established and agreed to by the task group to represent an installation condition. Three tests were conducted, one with the receptacle terminated with the 14 AWG copper-clad aluminum wrapped around the wiring binding screw, the second with a single conductor back wired into the pressure plate and the third with two conductors back wired into the pressure plate.

The test results found that after 10 cycles of fully inserting and removing the receptacle to the full extended position, the copper-clad aluminum

conductors for the back wired assemblies did not break and therefore passed this test.

For the wire binding screw termination, the first test found the flexing for the 10 cycles passed where the conductors did not break. But when the conductors were being removed both the black and white conductors broke off near the end of the insulation, see Appendix A photo 20. A second test was conducted and the black conductor was found to break off near the end of the insulation on the eighth cycle. A third test was completed, using a 14 AWG NM-B sample from another coil, and this assembly passed the 10 cycles and removal of conductors with no breaking or signs of weakening in the stripped portion of the conductor, see Appendix A photo 21.

As stated, there is no industry standard for completing this flexing test and the test was conducted due to specific questions asked by members of the task group. The results demonstrate that there may be limits to the amount of flexing these conductors can withstand, but it should be noted that in normal installations the insertion and removal of a wiring device occurs far less than the eight to ten times as conducted in this test.

6.0 Conclusions

The results from the temperature testing conducted in this project found the 14 AWG copper-clad aluminum to have terminal and conductor temperatures generally less than copper when tested at the 60°C ampacity values. In all cases, the temperature and temperature rise recorded were below those provided in the referenced UL standards. The flexing testing found that there may be some limitations to the number of flexing operations a 14 AWG copper-clad aluminum conductor can withstand, but the number of flexing operations to breakage is above those normally encountered in any installation.

As stated in the introduction, this testing project was to answer specific questions raised by the Bimetallics Task Group regarding temperature performance of 14 AWG copper-clad aluminum compared with 14 AWG copper in typical applications. **While testing conducted followed parts of several UL standards, it is to be understood the testing was only conducted to provide specific performance data and information as requested by the task group. The testing does not provide performance or data for certification of any of the components used for the testing.**

7.0 Test Equipment and Calibration

The following test and measurement equipment was used for the testing. The certificates of calibration for each of the above items is provided in Appendix E.

Description	manufacturer	Eaton Asset #	Cal Date	Cal Due
Thermocouples	Pacific Test and Measurement	N/A	7/10/2020	N/A
DACQ datalogger	Agilent (HP)	EM7054	7/16/2020	7/16/2021
DVM	Fluke	EM4437	7/16/2020	7/16/2021
DVM	Fluke	EM7014	7/16/2020	7/16/2021
DVM	Fluke	EM7024	7/16/2020	7/16/2021
CT	AEMC	EM6996	7/16/2020	7/16/2021
CT	AEMC	EM6997	7/16/2020	7/16/2021
CT	AEMC	EM8032	7/16/2020	7/16/2021
Torque wrench	CDI	EM8363	7/14/2020	7/14/2021
Tape measure	Stanley	EM6927	7/16/2020	7/16/2021

Appendix A - Photos

Photo 1 – Laboratory View

Photo 2 – Test Board and Test Equipment Arrangement

Appendix A - Photos

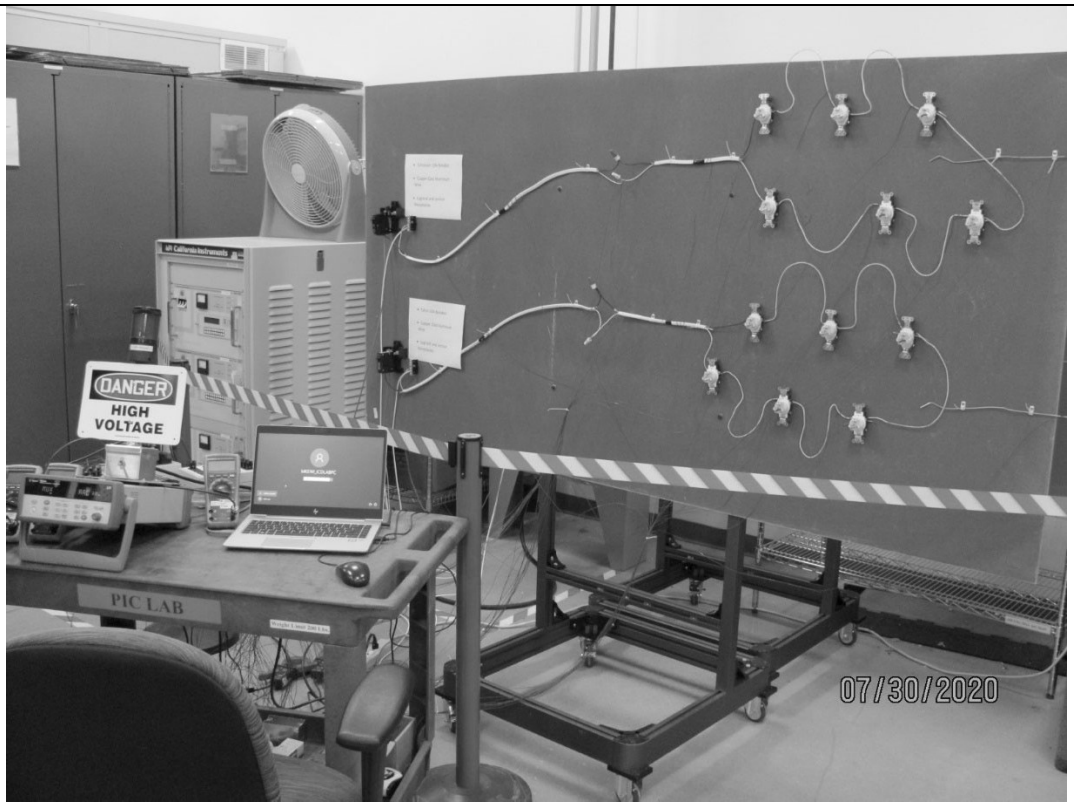


Photo 3 – Test Board and Test Equipment Arrangement

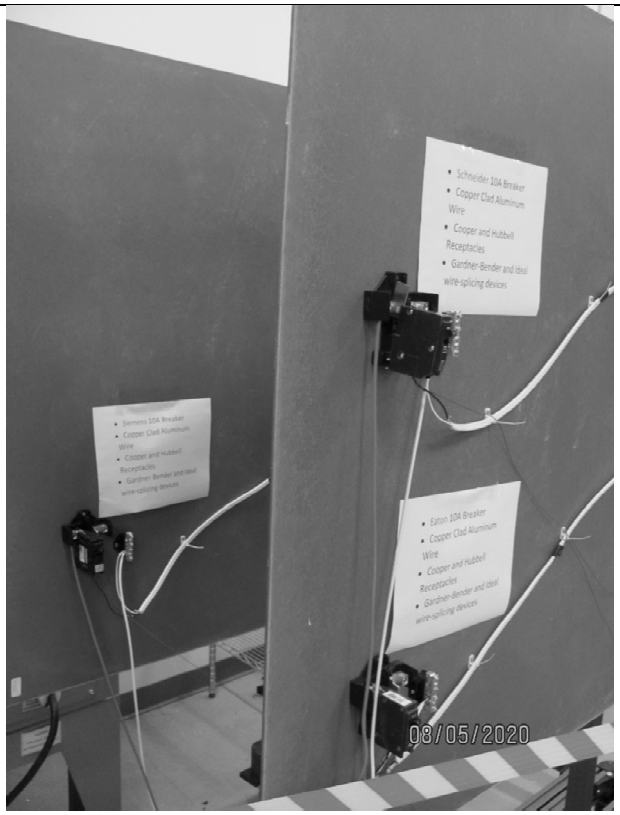


Photo 4 – Copper-Clad Aluminum with Eaton and Hubbell Receptacles

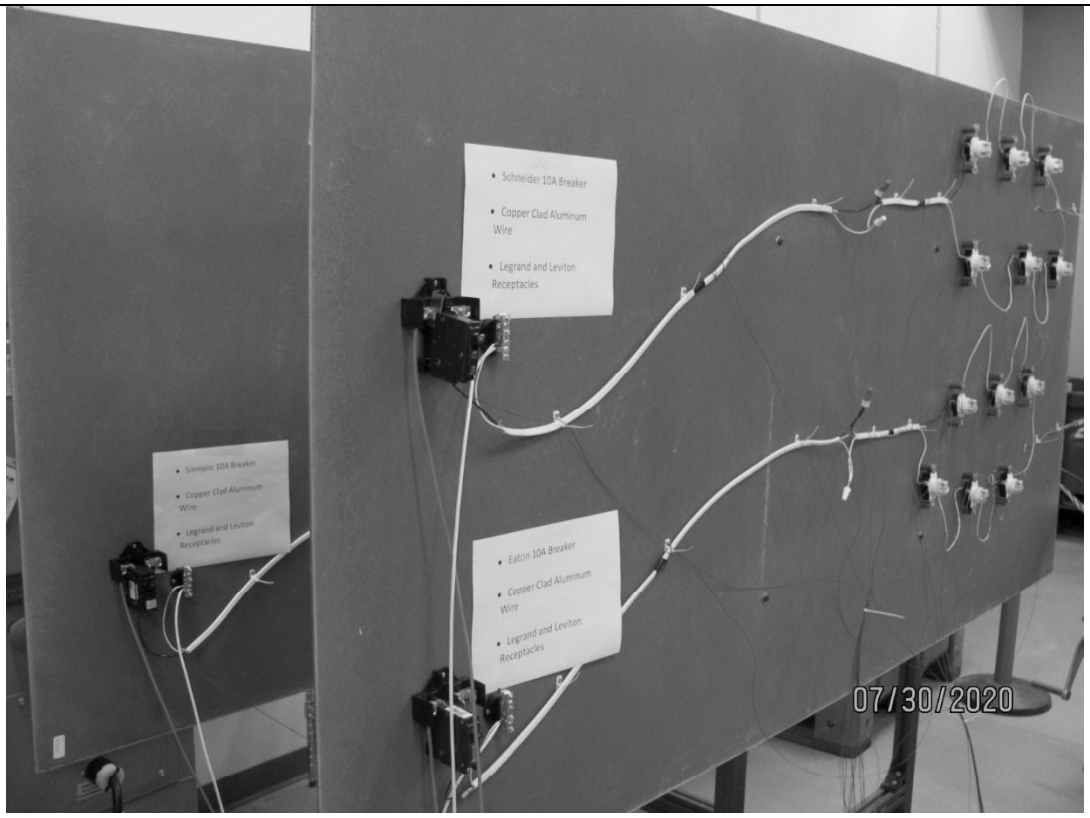


Photo 5 – Copper-Clad Aluminum with Legrand and Leviton Receptacles

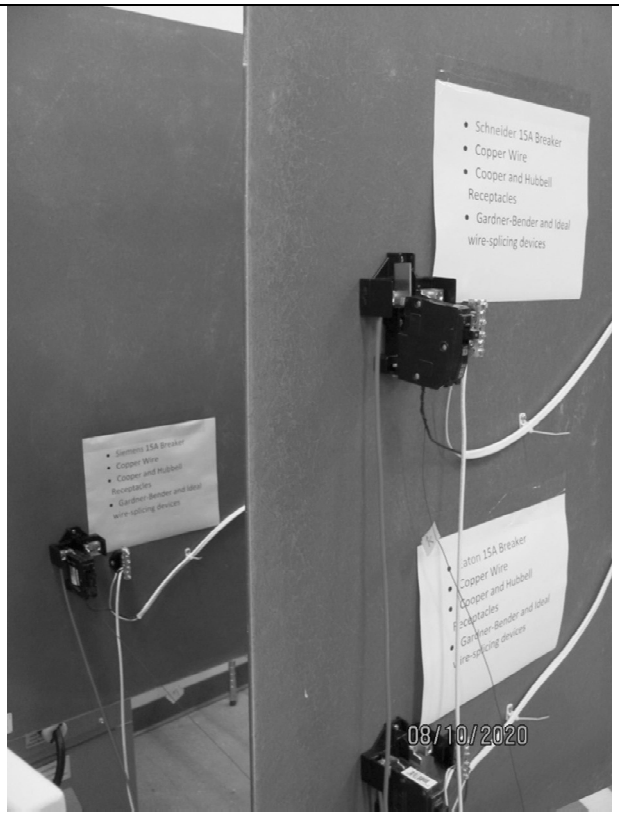


Photo 6 – Copper with Eaton and Hubbell Receptacles

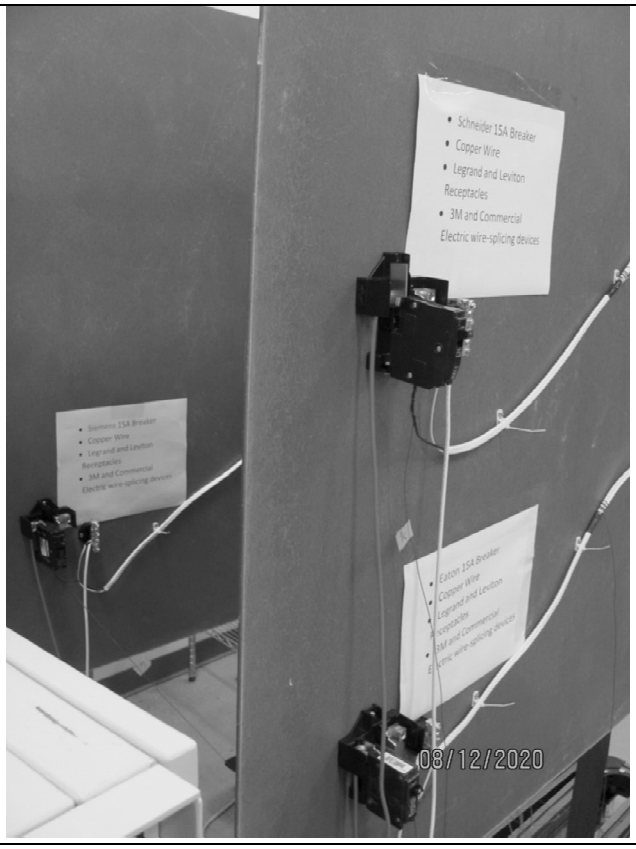


Photo 7 – Copper with Legrand and Leviton Receptacles

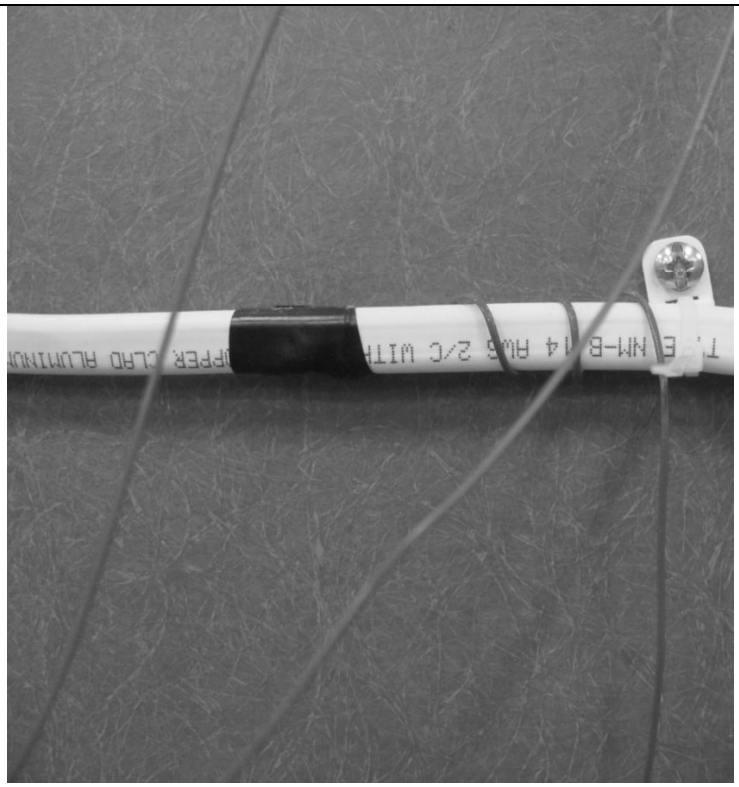


Photo 8 – Copper-Clad Aluminum NM-B Cable

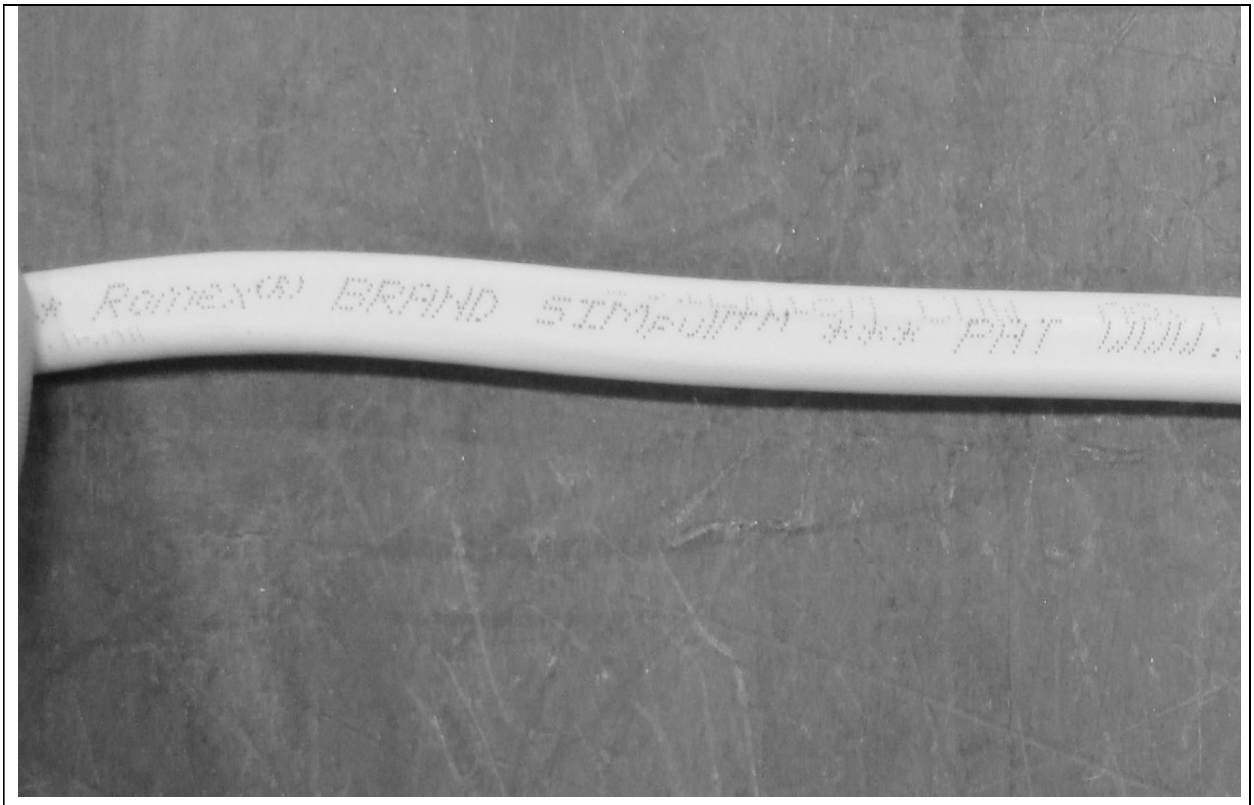


Photo 9 – Copper NM-B Cable

Photo 10 – Copper NM-B Cable Packaging

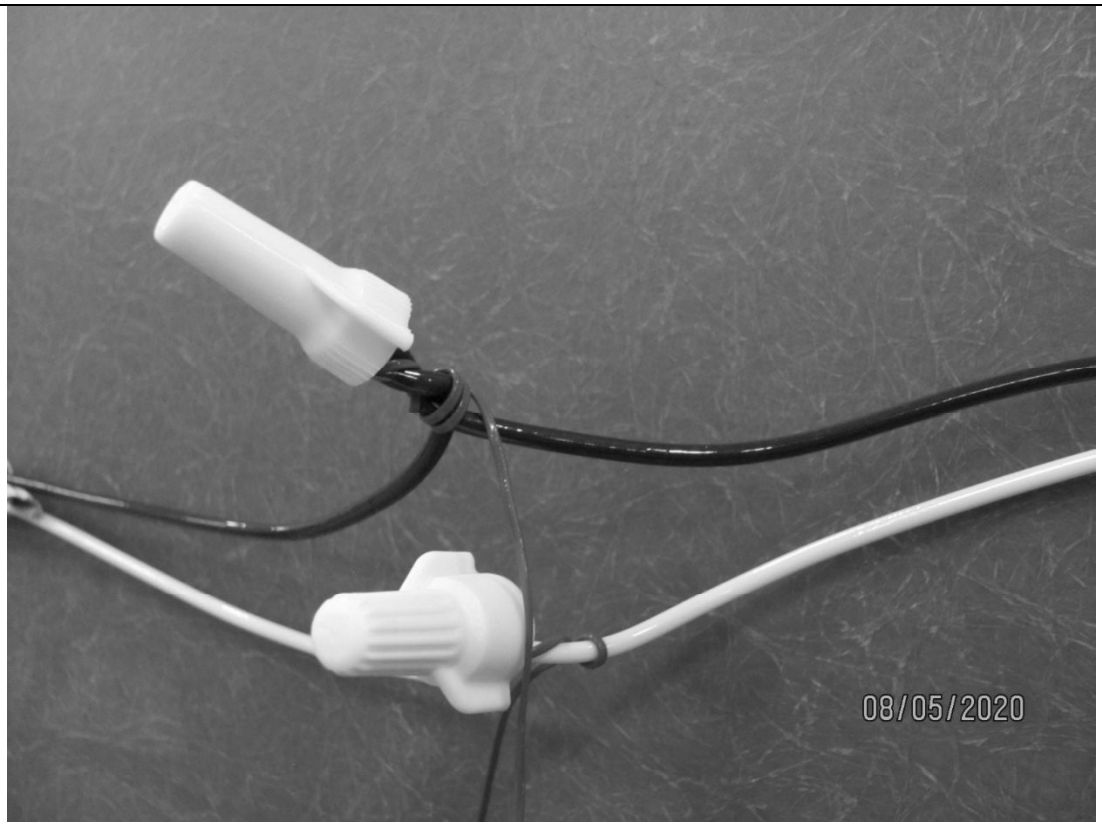


Photo 11 – Typical Installation of Wire Splicing Devices with Thermocouple

Photo 12 – Typical Installation of Receptacle using Wire Binding Screw

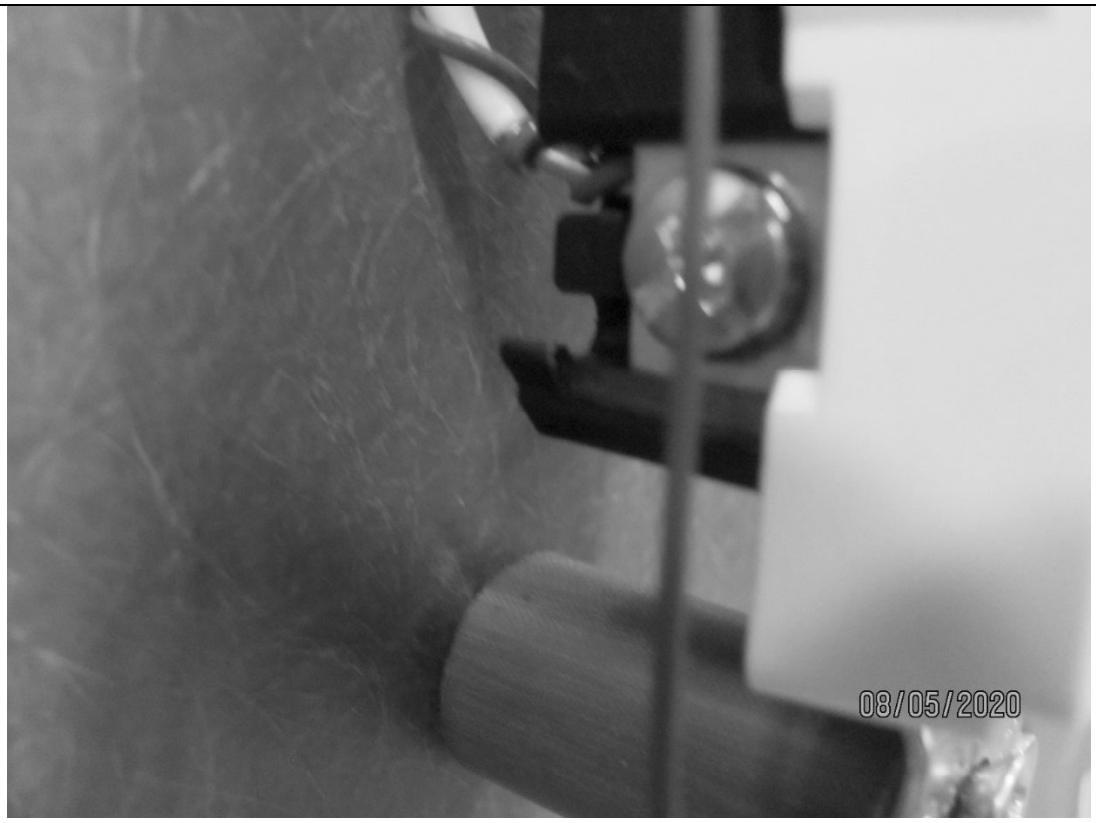


Photo 13 – Typical Installation of Receptacle Since Conductor Back Wired

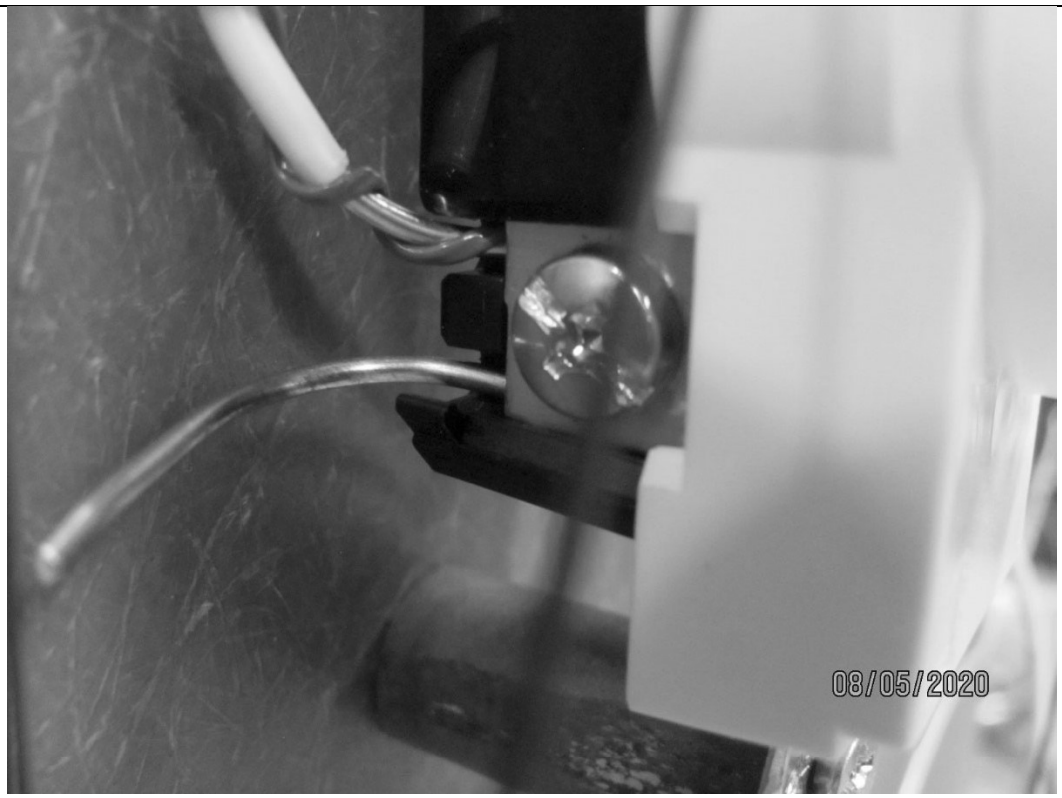


Photo 14 – Typical Installation of Receptacle Two Conductors Back Wired

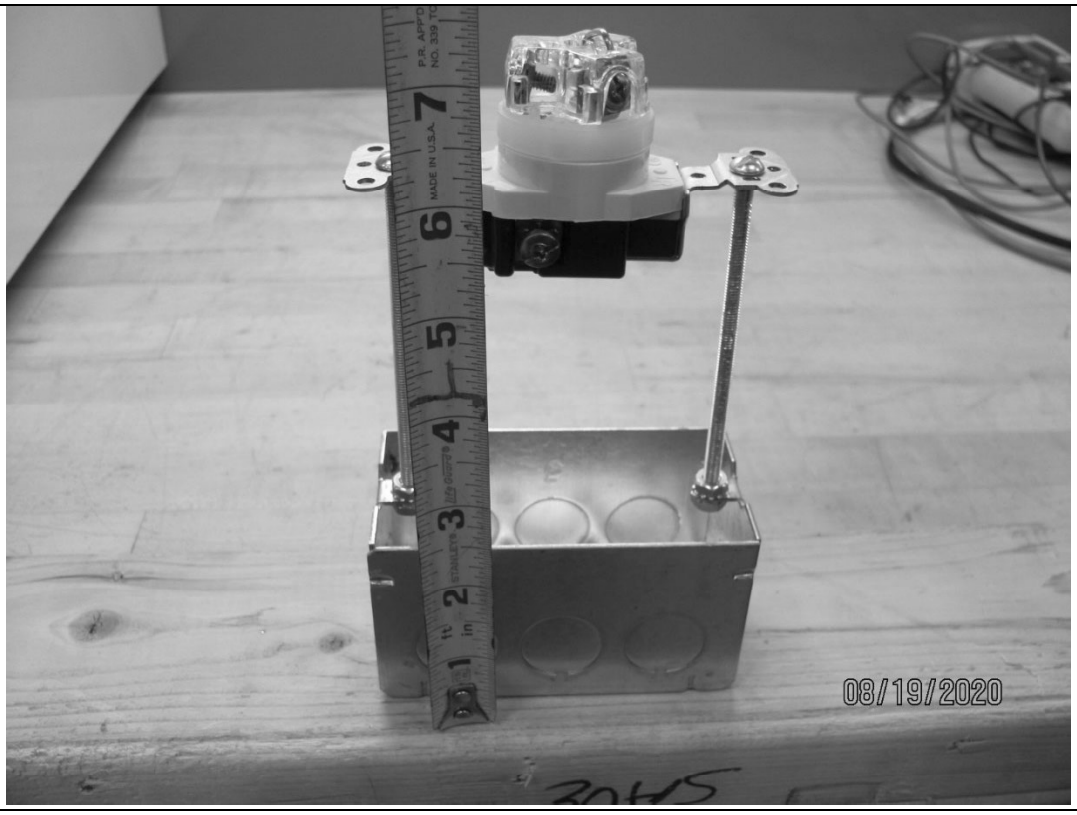


Photo 15 – Flexing Test Setup

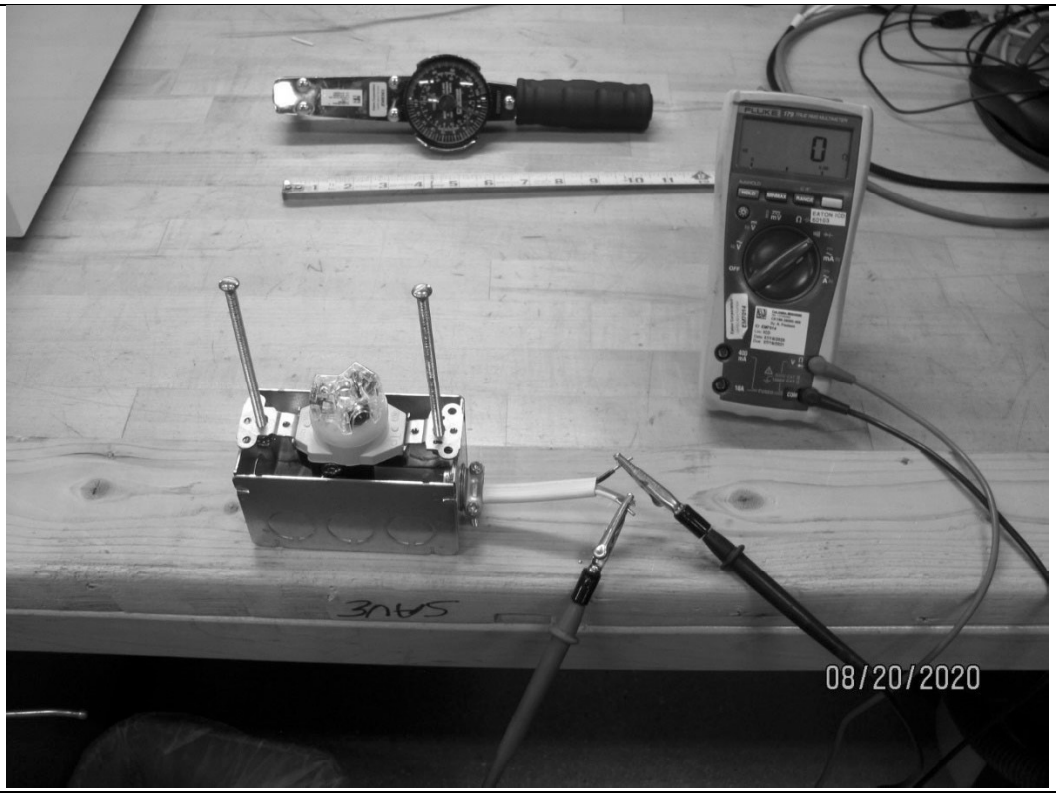


Photo 16 – Flexing Test Setup

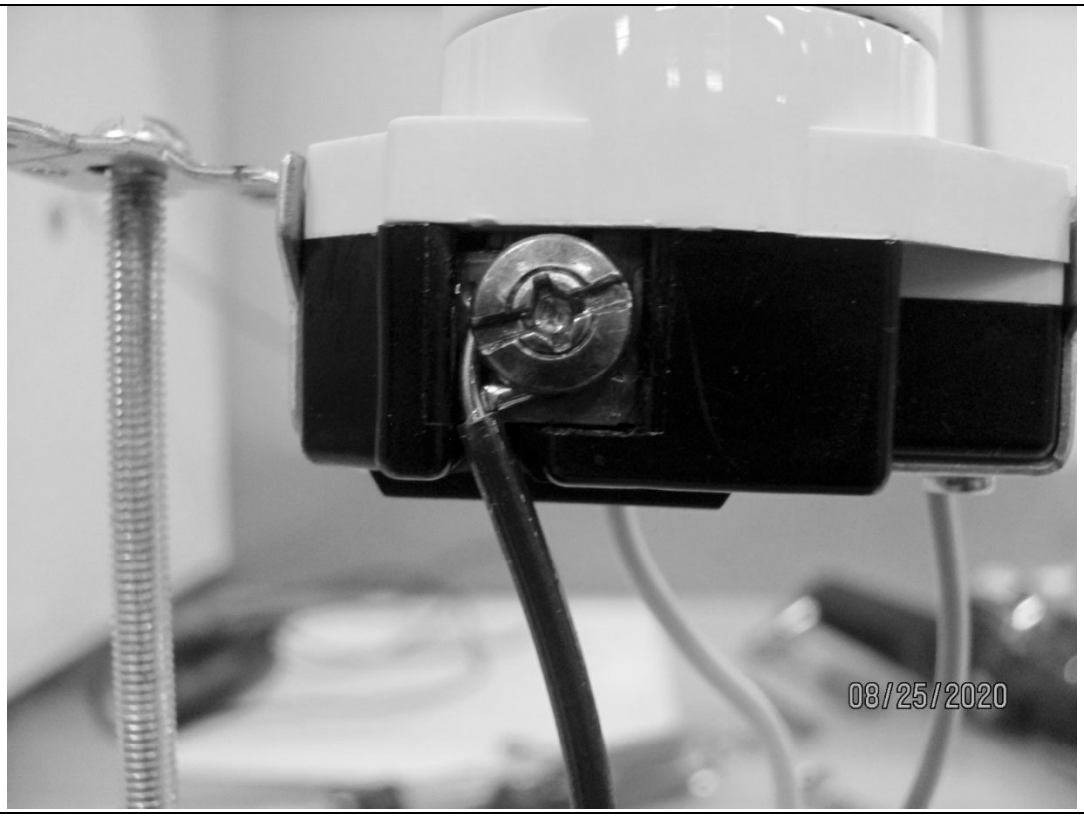


Photo 17 – Flexing Test Fully Extended

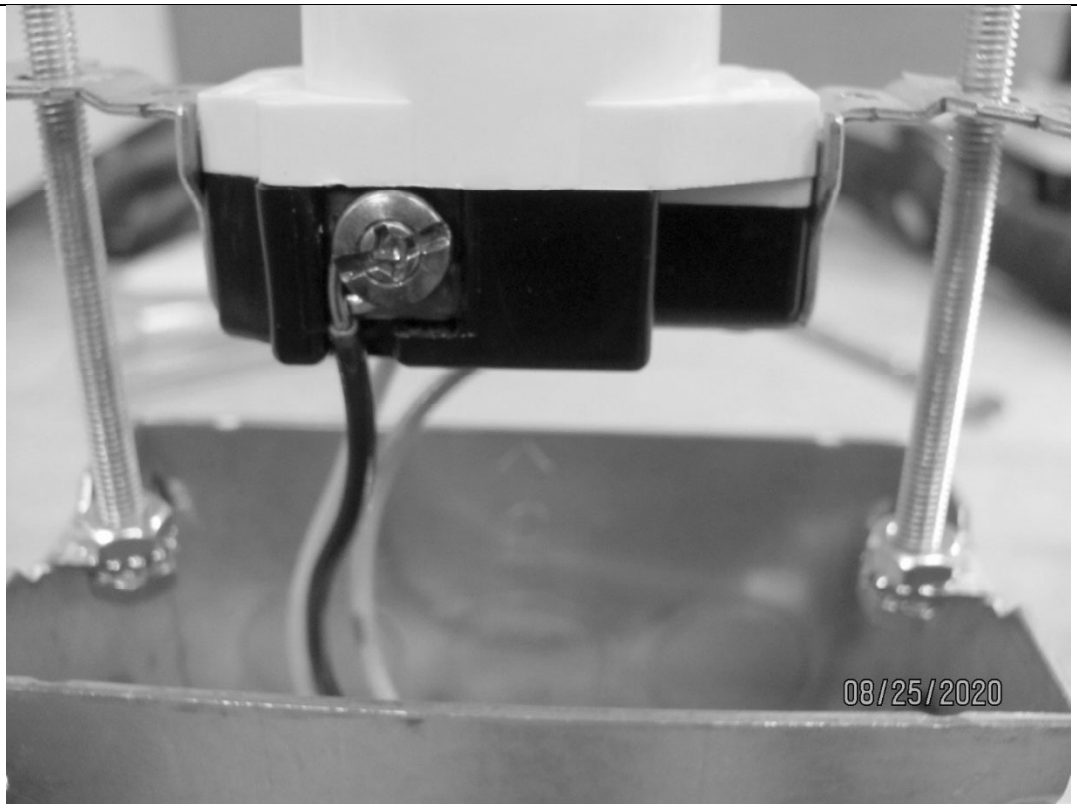


Photo 18 – Flexing Test Partial Insertion

Photo 19 – Flexing Test Fully Inserted

Photo 20 – Flexing Test Broken Conductors When Removing

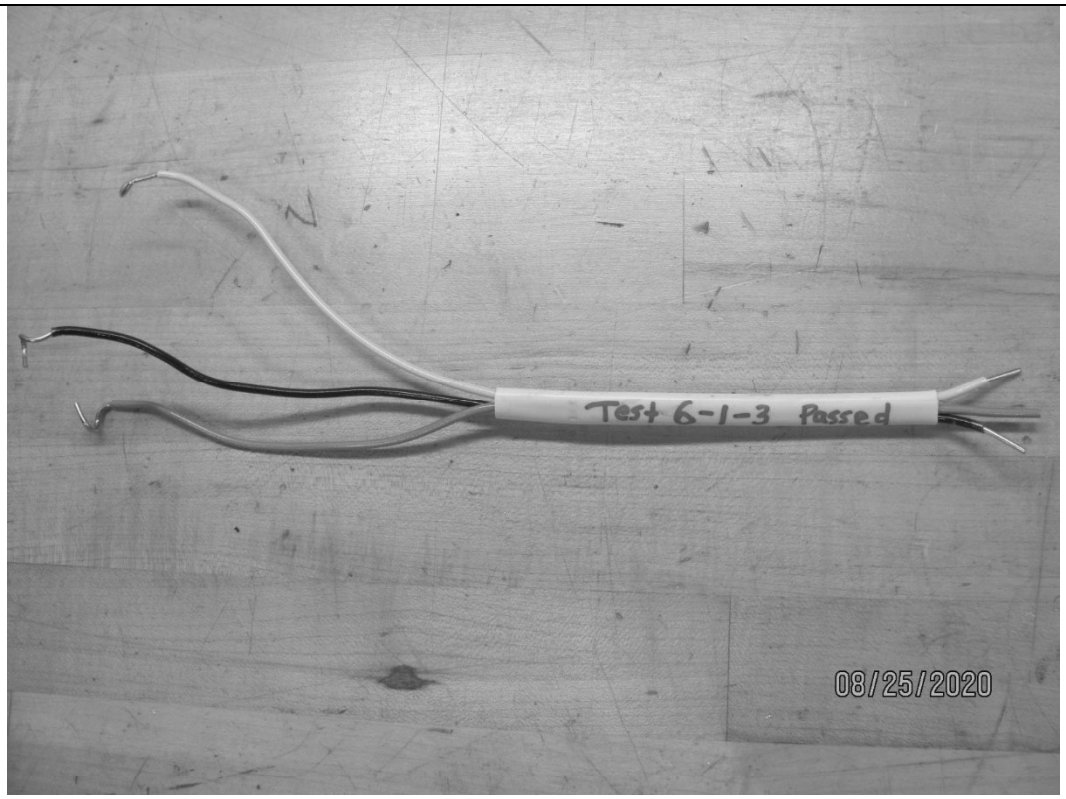


Photo 21 – Flexing Test Repeat No Conductor Breakage

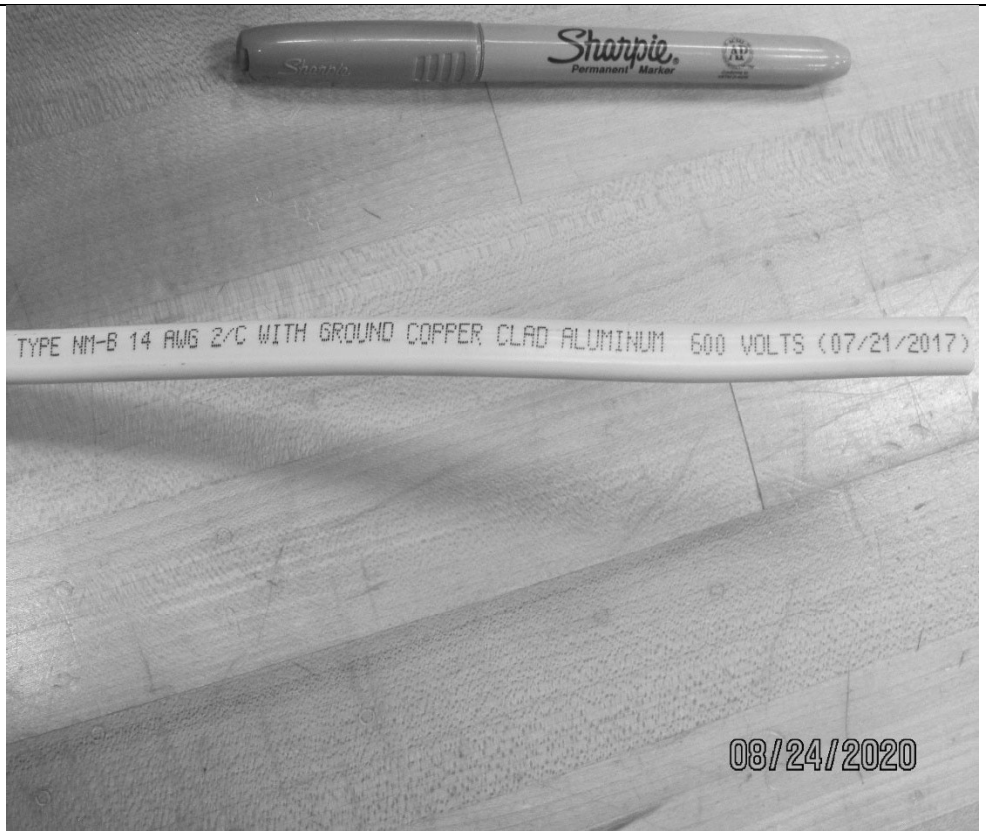


Photo 22 – Copper-Clad Aluminum NM-B Sample Packaging at Eaton

Photo 23 – Copper-Clad Aluminum THHN Sample Packaging at Eaton

Photo 24 – Copper-Clad Aluminum Sample Packaging at Eaton

Appendix B - Copper-Clad Aluminum Lab Report

COPPERWELD | Wired to Protect

The power of two

Metallurgical Laboratory Report

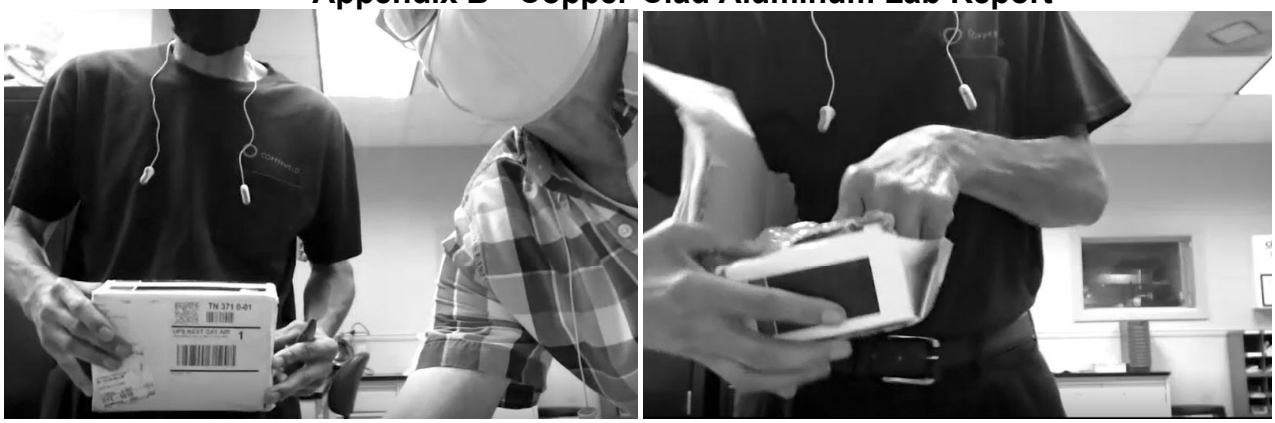
Customer:	**NEC Bimetallics Task Group**		
Subject:	**14 AWG Building Wire—NMB and THHN**		
Date:	**8-27-2020**	**Report No:**	**456**

Analysis By:	**Sammy Hampton --Metallographer**
Authored By:	**Sammy Hampton –Metallographer**
Approved By:	**Bill Lewey– QA Manager**

Tested to ASTM Designation: B 566-- 04a

The NM and THHN class samples in this report were sent to Copperweld via a sealed package by Eaton Menomonee Falls test lab. The chain of custody was not broken. The testing was witnessed by a third party as part of routine auditing service. The witnessing session was recorded. The copper clad aluminum conductor material from these samples that was tested on August 27, 2020 by the Copperweld Metallurgical Lab was manufactured by Copperweld Bimetallics to ASTM B566 standards.

Package as received from Eaton



Opening the Package

Package Contents

Appendix B - Copper-Clad Aluminum Lab Report

The wire consists of a core of aluminum with a continuous outer cladding of copper metallurgically bonded to the core throughout and meets the requirements of this specification (5.1).

Test required	Test result	ASTM B 566 requirement	Result
Diameter	**0.0641”**	**± 0.0001 0.0640” minimum 0.0642” maximum**	**Pass**
Break load (lbs.)	55 pounds	64.4 pounds maximum	**Pass**
Tensile strength (psi)	17195 psi	20000 (psi) maximum	**Pass**
% elongation	22.78%	15.0% minimum	**Pass**
Copper thickness (minimum)	0.00148” = 4.6% of wire radius	minimum copper thickness= 3.5% of wire radius	**Pass**
Copper volume	10.05%	8% minimum 12% maximum	**Pass**
Adhesion test	No separation (see attached image 1)	The wire shall be repeatedly reverse bent to fracture by any convenient means. The copper clad aluminum wire shall be free from cladding delamination.	**Pass**
Cohesion test	No seams or splits (see attached images 2 and 3)	The copper clad aluminum wire shall be free from seams or splits	**Pass**

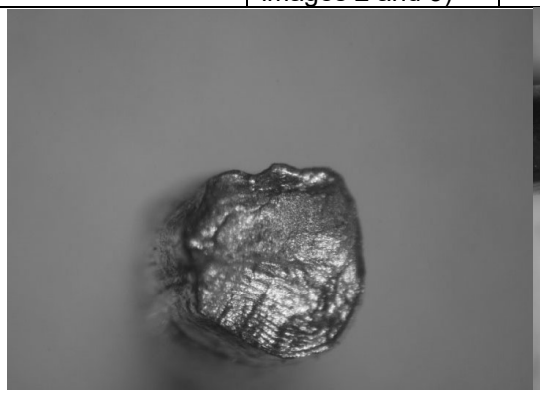


Image 1: adhesion test

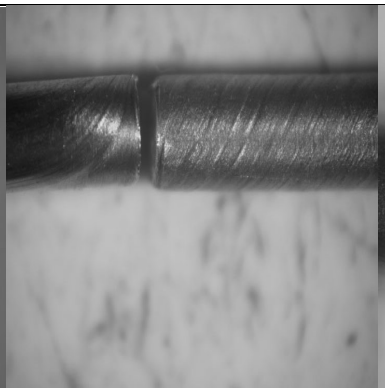


Image 2: cohesion test (torsion)

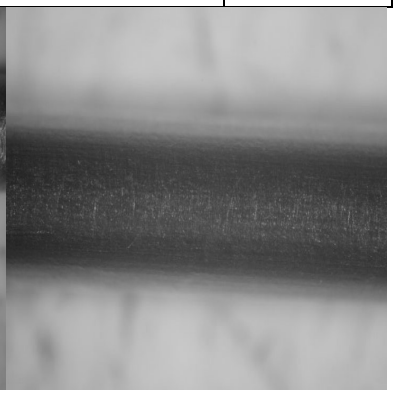


image 3: cohesion test (reverse torsion)

Test and measurement equipment

Equipment	Gauge ID	In calibration	Next due calibration
Micrometer	**CP-01**	**Yes**	**April 2021**
Tensile tester	**1755-2000**	**Yes**	**January 2022**
Ohmmeter	**62-1625**	**Yes**	**December 2020**
Calibration Certificates Attached below			

PRECISION CALIBRATION SYSTEMS
107 N Porter St
Winchester, TN 37398
E-mail: info@pcsllctn.com
Phone: 866-521-3823
Website: www.pcsllctn.com

INSTRUMENT CALIBRATION REPORT

Copperweld

Instrument ID	CP-01				
Description	Micrometer				
Calibrated	8/3/2020			**Performed At**	Customer Location
Manufacturer	Mitutoyo	**Location**	Main	**Frequency**	Semi-Annual
Model Number	293-344-30	**Building**	254 Cotton Mill Rd. Fayetteville, TN 37334	**Certificate #**	CO080320JM-03
Serial Number	66936496	**Department**	Quality	**Temp**	73°F
Cal Procedure	QS0003JB2010	**Status**	In Service	**Humidity**	59%

Calibration Specifications

Group # 1
Group Name OD

Nom In Val / In Val	In Type	Std Accy	Acc %	+/-	Out Val	Out Type	Fnd As	Lft As	In Tol
0.25000 / 0.25000	Inch	Plus / Minus	0.000000	±0.00010	0.25000	Inch	0.25000	0.25000	Yes
0.50000 / 0.50000	Inch	Plus / Minus	0.000000	±0.00010	0.50000	Inch	0.50000	0.50000	Yes
1.00000 / 1.00000	Inch	Plus / Minus	0.000000	±0.00010	1.00000	Inch	1.00000	1.00000	Yes

Test Instruments Used During the Calibration

Test Instrument ID	Description	Manufacturer	Model Number	Serial Number	(As Of Cal Entry Date) Last Cal Date	Next Cal Date
Z-GA-010 GAGE BLCK SET STD SHOP	Gage Block 81pc Set Standard	China	Rectangular Steel	E1599	4/8/2016	4/30/2021

Notes about this calibration

Uncertainty = ± (64.9+5.2L) µin (95%CL; K=2)

Calibration Result Calibration Successful
Who Calibrated James Meadows
Finalized By James Meadows
Date Finalized 8/3/2020 9:19:05AM

Total expanded measurement uncertainties expressed are based on a confidence level of 95%, coverage factor of (k=2). Decision Rule: The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. This is considered "shared responsibility." This calibration was conducted using standards traceable to the SI through NIST. The results on this certificate of accuracy apply only to the item described above. Accredited to ISO/IEC 17025: 2017.

Laboratory Authorized Signature

Revision Date:05/08/2020
Rev: 04

Page 1 of 1

QF0016

PCS PRECISION CALIBRATION SYSTEMS
107 N Porter St
Winchester, TN 37398
E-mail: info@pcsllctn.com
Phone: 866-521-3823
Website: www.pcsllctn.com

INSTRUMENT CALIBRATION REPORT

Copperweld

Instrument ID 1755-2000
Description Tensile Tester (2 Load cells)
Calibrated 8/4/2020
Performed At Customer Location

Manufacturer Thwing-Albert Instruments
Model Number EJA
Serial Number 1755-2000
Cal Procedure QS0033BG2013
Location Main
Building 254 Cotton Mill Rd. Fayetteville, TN 37334
Department Quality
Status In Service
Frequency Semi-Annual
Certificate # CO080420JM-13
Temp 70°F
Humidity 57%

Calibration Specifications

Group # 1
Group Name 0-11lb Load Cell 627022

Nom In Val / In Val	In Type	Std Accy	Acc %	+/-	Out Val	Out Type	Fnd As	Lft As	In Tol
1 / 1	lbf	Pct of Range	0.500000	0.00	1.00	lbf	1.01	1.01	Yes
2 / 2	lbf	Pct of Range	0.500000	0.00	2.00	lbf	2.01	2.01	Yes
3 / 3	lbf	Pct of Range	0.500000	0.00	3.00	lbf	3.01	3.01	Yes
5 / 5	lbf	Pct of Range	0.500000	0.00	5.00	lbf	5.02	5.02	Yes
7 / 7	lbf	Pct of Range	0.500000	0.00	7.00	lbf	7.03	7.03	Yes
10 / 10	lbf	Pct of Range	0.500000	0.00	10.00	lbf	10.04	10.04	Yes

Group # 2
Group Name 0-225 lb Load cell 608236

Nom In Val / In Val	In Type	Std Accy	Acc %	+/-	Out Val	Out Type	Fnd As	Lft As	In Tol
5 / 5	lbf	Pct of Range	0.500000	0.00	5.00	lbf	5.00	5.00	Yes
20.446 / 20.446	lbf	Pct of Range	0.500000	0.00	20.45	lbf	20.48	20.48	Yes
50.414 / 50.414	lbf	Pct of Range	0.500000	0.00	50.41	lbf	50.48	50.48	Yes
88.532 / 88.532	lbf	Pct of Range	0.500000	0.00	88.53	lbf	88.64	88.64	Yes
99.044 / 99.044	lbf	Pct of Range	0.500000	0.00	99.04	lbf	99.15	99.15	Yes
117.60 / 117.60	lbf	Pct of Range	0.500000	0.00	117.60	lbf	117.73	117.73	Yes
131.71 / 131.71	lbf	Pct of Range	0.500000	0.00	131.71	lbf	131.83	131.83	Yes
151.04 / 151.04	lbf	Pct of Range	0.500000	0.00	151.04	lbf	151.22	151.22	Yes
161.19 / 161.19	lbf	Pct of Range	0.500000	0.00	161.19	lbf	161.38	161.38	Yes
207.76 / 207.76	lbf	Pct of Range	0.500000	0.00	207.76	lbf	207.99	207.99	Yes

PCS PRECISION CALIBRATION SYSTEMS
107 N Porter St
Winchester, TN 37398
E-mail: info@pcsllctn.com
Phone: 866-521-3823
Website: www.pcsllctn.com

INSTRUMENT CALIBRATION REPORT

Copperweld

Instrument ID 1755-2000
Description Tensile Tester (2 Load cells)
Calibrated 8/4/2020
Performed At Customer Location

Test Instruments Used During the Calibration

Test Instrument ID	Description	Manufacturer	Model Number	Serial Number	(As Of Cal Entry Date) Last Cal Date	Next Cal Date
Z-LO-005 5K LOAD CELL	Load Cell, 5000lb, Tension & Compression	Futek	LSB453	575093	1/7/2020	1/31/2022
Z-WE-003 HANGING WEIGHTS	Weight Set, 1-20lbs, Cast Iron	Rice Lake	ASTM Class 6	D7-D10 (20), D1-D4 (10), D1-D2 (2), 8MD8 (1), 8MB4 (2),8MB5 (5)	3/26/2019	3/31/2021

Notes about this calibration
Uncertainty = ± 0.23% of Reading (95%CL; K=2)

Calibration Result Calibration Successful
Who Calibrated James Meadows
Finalized By James Meadows
Date Finalized 8/4/2020 1:12:08PM

Total expanded measurement uncertainties expressed are based on a confidence level of 95%, coverage factor of (k=2). Decision Rule: The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. This is considered "shared responsibility." This calibration was conducted using standards traceable to the SI through NIST. The results on this certificate of accuracy apply only to the item described above. Accredited to ISO/IEC 17025: 2017.

Laboratory Authorized Signature

Appendix B - Copper-Clad Aluminum Lab Report

PRECISION CALIBRATION SYSTEMS
107 N Porter St
Winchester, TN 37398
E-mail: info@pcsllctn.com
Phone: 866-521-3823
Website: www.pcsllctn.com

INSTRUMENT CALIBRATION REPORT

Copperweld

Instrument ID 62-1625
Description Micro Ohm Meter
Calibrated 8/4/2020
Performed At Customer Location

Manufacturer Valhalla Scientific
Model Number 4176
Serial Number 62-1625
Cal Procedure QS0011JB2010
Location Main
Building 254 Cotton Mill Rd. Fayetteville, TN 37334
Department Quality
Status In Service
Frequency Semi-Annual
Certificate # CO080420JM-03
Temp 70°F
Humidity 57%

Calibration Specifications

Group # 1
Group Name Ohm - Source

Nom In Val / In Val	In Type	Std Accy	Acc %	+/-	Out Val	Out Type	End As	Lft As	In Tol
1.000 / 1.000	Ohm	Pct of Reading	0.040000	0.0000	1.0000	Ohm	0.9998	0.9998	Yes
10.000 / 10.000	Ohm	Pct of Reading	0.040000	0.000	10.000	Ohm	9.999	9.999	Yes
100.000 / 100.000	Ohm	Pct of Reading	0.040000	0.00	100.00	Ohm	99.99	99.99	Yes

Test Instruments Used During the Calibration

Test Instrument ID	Description	Manufacturer	Model Number	Serial Number	(As Of Cal Entry Date) Last Cal Date	Next Cal Date
Z-EL-020 DECADE RESISTANCE BOX	General Radio Small Decade Resistance Box	General Radio	1433-U	2545	12/18/2018	12/31/2020

Notes about this calibration

Uncertainty = ± 2 mOhm (95%CL; K=2)

Calibration Result Calibration Successful
Who Calibrated James Meadows
Finalized By James Meadows
Date Finalized 8/4/2020 12:47:33PM

Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). Decision Rule: The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. This is considered "shared responsibility." This calibration was conducted using standards traceable to the SI through NIST. The results on this certificate of accuracy apply only to the item described above. Accredited to ISO/IEC 17025: 2017.

Laboratory Authorized Signature

Revision Date:05/08/2020
Rev: 04

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QF0016

Follow-up Service Inspection Report
E491185 1200827165202

INSPECTION DETAILS			
Date:	2020-08-27	File Number.:	E491185
Responsible Office:	Melville	Volume:	1
Inspection Center:	232	CCN:	DVVU2
Product Type:	CCA Conductor	UL Rep Name:	Gregory Cornett
Deliverable Type:	Recognized	UL Rep ID:	20708
Party Site Number:	1626131	Subscriber Factory No.:	
Manufacturer Name:	Copperweld Bimetallics LLC	Factory Rep Name	Mr. Sammy Hampton
Manufacturer Address:	254 Cotton Mill Rd Fayetteville, TN 37334	Factory Rep Phone:	931-433-0495
		Factory Rep Email:	shampton@copperweld.com
Nature of visit:	Regular Inspection	Sample Status:	Sample requirements fulfilled for sample period
UL Marks Used?	Yes	UL Marks Removed?	No
Variation Notice Issued?	No	Inspection Conducted Remotely?	Yes
Comments After Submission:			

PRODUCT DOCUMENTS/PRODUCTION READY VISIT			
Model	**Product**	**Section**	**Multiple Listed**
14 Awg Class 10A	Copper Clad Aluminum	1	No

SAMPLE DOCUMENTS			
If samples are required to be sent to UL, indicate below. If required samples are not sent, explain in the Comments area.			
No Samples			
Additional Comments	14 Awg conductors from the NMB and THHN samples passed the UL tests for DVVU2, including Tensile, Elongation, copper thickness and DC Resistance.		

In addition to the requirements specified in the applicable UL Services agreement and Follow-Up Service Procedure, UL further defines responsibilities, duties and requirements for both manufacturers and UL representatives in the document titled "UL Mark Surveillance Requirements" that can be located at www.ul.com/fus, and in accordance with the applicable terms and conditions of the document at www.ul.com/responsibilities. Manufacturers without Internet access may obtain the current versions of these documents from their local UL customer service representative or UL field representative.

Appendix C1 Static Heating Testing at 100% Rated Current

Test 1a - thru Mfg. 1 10-amp breaker at 100% current (10A * 100% = 10A); max temps, reading every 60s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		124	129	134			
time (HH:MM:SS) →		1:53:00	1:58:00	2:03:00			
1a	Mfg. 11 - 1	28.70	28.86	28.73	6.47	6.63	6.50
2a	Mfg. 11 - 2	28.89	29.01	28.84	6.66	6.78	6.61
3a	Mfg. 11 - 3	27.88	28.00	27.72	5.65	5.77	5.49
4a	Mfg. 8 - 1	29.18	29.27	29.25	6.95	7.04	7.02
5a	Mfg. 8 - 2	28.99	29.11	28.99	6.76	6.88	6.76
6a	Mfg. 8 - 3	29.00	29.15	28.92	6.77	6.92	6.69
7a	circuit breaker	32.68	32.65	32.75	10.45	10.42	10.52
8a	line wire	32.25	32.29	32.43	10.02	10.06	10.20
9a	line wire splicing device	29.84	29.65	29.07	7.61	7.42	6.84
10a	load wire	30.67	30.92	30.94	8.44	8.69	8.71
11a	load wire splicing device	30.11	29.88	29.27	7.88	7.65	7.04
12a	room ambient	22.39	22.44	21.87			
13a	current (amps)	10.03	10.03	10.03			

Test 1a - thru Mfg. 1 15-amp breaker at 100% current (15A * 100% = 15A); max temps, reading every 60s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		80	85	90			
time (HH:MM:SS) →		1:17:00	1:22:00	1:27:00			
1a	Mfg. 11 - 1	33.06	33.61	33.40	11.02	11.58	11.36
2a	Mfg. 11 - 2	33.64	33.95	33.94	11.60	11.91	11.90
3a	Mfg. 11 - 3	31.05	31.56	31.60	9.01	9.52	9.56
4a	Mfg. 8 - 1	34.10	34.15	34.23	12.06	12.11	12.19
5a	Mfg. 8 - 2	33.60	34.20	33.86	11.56	12.16	11.82
6a	Mfg. 8 - 3	32.94	33.68	33.29	10.91	11.64	11.25
7a	circuit breaker	40.86	40.44	40.64	18.82	18.41	18.60
8a	line wire	33.93	34.21	33.87	11.89	12.17	11.83
9a	line wire splicing device	36.89	37.11	36.82	14.85	15.07	14.78
10a	load wire	32.70	33.48	32.99	10.66	11.44	10.95
11a	load wire splicing device	32.72	33.49	32.70	10.68	11.45	10.66
12a	room ambient	21.84	22.27	22.01			
13a	current (amps)	15.02	15.01	15.02			

Test 1b - thru Mfg. 2 10-amp breaker at 100% current (10A * 100% = 10A); max temps, reading every 60s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		124	129	134			
time (HH:MM:SS) →		1:53:00	1:58:00	2:03:00			
1b	Mfg. 11 - 1	28.57	28.60	28.36	6.49	6.52	6.27
2b	Mfg. 11 - 2	28.65	28.68	28.48	6.57	6.60	6.40
3b	Mfg. 11 - 3	27.37	27.39	27.10	5.28	5.31	5.02
4b	Mfg. 8 - 1	29.14	29.23	29.15	7.05	7.15	7.07
5b	Mfg. 8 - 2	30.65	30.75	30.48	8.57	8.66	8.40
6b	Mfg. 8 - 3	28.04	28.10	27.73	5.96	6.02	5.64
7b	circuit breaker	36.63	36.79	37.20	14.55	14.70	15.12
8b	line wire	30.98	31.03	30.93	8.90	8.95	8.85
9b	line wire splicing device	28.97	28.69	28.06	6.89	6.61	5.98
10b	load wire	28.60	28.55	28.00	6.52	6.47	5.92
11b	load wire splicing device	28.64	28.49	27.92	6.56	6.41	5.84
12b	room ambient	22.35	22.28	21.62			
13b	current (amps)	10.00	10.00	10.00			

Test 1b - thru Mfg. 2 15-amp breaker at 100% current (15A * 100% = 15A); max temps, reading every 60s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		80	85	90			
time (HH:MM:SS) →		1:17:00	1:22:00	1:27:00			
1b	Mfg. 11 - 1	33.38	33.85	33.55	11.43	11.89	11.59
2b	Mfg. 11 - 2	33.29	33.49	33.67	11.34	11.54	11.72
3b	Mfg. 11 - 3	30.94	31.47	31.45	8.99	9.52	9.49
4b	Mfg. 8 - 1	34.03	34.28	34.44	12.07	12.32	12.48
5b	Mfg. 8 - 2	33.61	34.03	33.75	11.66	12.08	11.80
6b	Mfg. 8 - 3	33.00	33.71	33.25	11.05	11.75	11.29
7b	circuit breaker	44.97	44.86	45.02	23.02	22.91	23.06
8b	line wire	33.21	33.70	33.32	11.25	11.74	11.37
9b	line wire splicing device	30.81	31.77	30.80	8.86	9.82	8.85
10b	load wire	32.53	33.49	32.83	10.58	11.54	10.88
11b	load wire splicing device	31.51	32.52	31.43	9.56	10.56	9.47
12b	room ambient	21.76	22.22	21.88			
13b	current (amps)	15.01	15.01	15.01			

Test 1c - thru Mfg. 3 10-amp breaker at 100% current (10A * 100% = 10A); max temps, reading every 60s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		124	129	134			
time (HH:MM:SS) →		1:53:00	1:58:00	2:03:00			
1c	Mfg. 11 - 1	29.46	29.56	29.18	7.40	7.50	7.12
2c	Mfg. 11 - 2	28.97	29.12	28.68	6.91	7.06	6.62
3c	Mfg. 11 - 3	27.82	28.02	27.47	5.76	5.96	5.41
4c	Mfg. 8 - 1	29.30	29.40	29.33	7.24	7.34	7.27
5c	Mfg. 8 - 2	28.68	28.72	28.43	6.62	6.66	6.37
6c	Mfg. 8 - 3	28.19	28.27	27.81	6.13	6.21	5.75
7c	circuit breaker	35.04	35.28	35.13	12.98	13.22	13.07
8c	line wire	31.23	31.27	30.87	9.17	9.21	8.81
9c	line wire splicing device	28.59	28.61	27.53	6.53	6.55	5.47
10c	load wire	30.74	30.84	30.26	8.68	8.78	8.20
11c	load wire splicing device	29.74	29.67	28.50	7.68	7.61	6.44
12c	room ambient	22.29	22.23	21.67			
13c	current (amps)	10.01	10.01	10.01			

Test 1c - thru Mfg. 3 15-amp breaker at 100% current (15A * 100% = 15A); max temps, reading every 60s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		80	85	90			
time (HH:MM:SS) →		1:17:00	1:22:00	1:27:00			
1c	Mfg. 11 - 1	32.95	33.38	33.25	11.06	11.48	11.36
2c	Mfg. 11 - 2	33.50	33.89	33.73	11.61	12.00	11.84
3c	Mfg. 11 - 3	32.27	32.60	32.50	10.38	10.71	10.61
4c	Mfg. 8 - 1	33.33	33.66	33.62	11.44	11.77	11.72
5c	Mfg. 8 - 2	33.87	34.28	34.11	11.98	12.39	12.21
6c	Mfg. 8 - 3	32.50	32.88	32.80	10.61	10.99	10.91
7c	circuit breaker	42.51	42.65	42.50	20.62	20.75	20.60
8c	line wire	31.74	32.44	32.16	9.84	10.54	10.27
9c	line wire splicing device	32.46	33.55	32.53	10.57	11.66	10.64
10c	load wire	32.23	33.29	32.70	10.34	11.40	10.81
11c	load wire splicing device	29.96	31.50	30.18	8.07	9.61	8.29
12c	room ambient	21.65	22.13	21.90			
13c	current (amps)	15.02	15.02	15.02			

Test 1a - thru Mfg. 1 10-amp breaker at 100% current (10A * 100% = 10A); max temps, reading every 60s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		67	72	77			
time (HH:MM:SS) →		1:04:00	1:09:00	1:14:00			
1a	Mfg. 10 - 1	33.35	33.09	33.35	11.17	10.90	11.17
2a	Mfg. 10 - 2	29.93	29.88	29.88	7.75	7.70	7.70
3a	Mfg. 10 - 3	28.83	28.80	28.74	6.65	6.62	6.56
4a	Mfg. 9 - 1	28.96	28.89	28.94	6.78	6.71	6.76
5a	Mfg. 9 - 2	29.33	29.07	29.09	7.15	6.89	6.91
6a	Mfg. 9 - 3	28.20	28.02	27.93	6.01	5.84	5.75
7a	circuit breaker	32.75	32.55	32.65	10.57	10.37	10.47
8a	line wire	32.76	32.27	32.44	10.58	10.09	10.26
9a	line wire splicing device	29.85	29.45	29.15	7.67	7.27	6.97
10a	load wire	31.09	30.73	31.01	8.91	8.55	8.83
11a	load wire splicing device	30.90	30.16	30.15	8.72	7.98	7.97
12a	room ambient	22.53	22.20	21.82			
13a	current (amps)	10.02	10.02	10.02			

Test 1a - thru Mfg. 1 15-amp breaker at 100% current (15A * 100% = 15A); max temps, reading every 60s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		122	127	132			
time (HH:MM:SS) →		2:00:00	2:05:00	2:10:00			
1a	Mfg. 10 - 1	38.41	38.10	38.31	17.09	16.78	16.99
2a	Mfg. 10 - 2	39.48	39.23	39.28	18.16	17.91	17.96
3a	Mfg. 10 - 3	34.47	34.18	34.12	13.15	12.87	12.80
4a	Mfg. 9 - 1	37.47	37.35	37.38	16.16	16.03	16.06
5a	Mfg. 9 - 2	38.46	38.17	38.12	17.14	16.85	16.80
6a	Mfg. 9 - 3	31.54	31.29	31.18	10.22	9.97	9.86
7a	circuit breaker	40.70	40.66	40.65	19.38	19.34	19.33
8a	line wire	34.07	34.00	34.12	12.75	12.69	12.80
9a	line wire splicing device	35.66	35.31	35.13	14.34	13.99	13.81
10a	load wire	32.81	32.43	32.75	11.49	11.11	11.43
11a	load wire splicing device	33.16	32.96	32.94	11.84	11.64	11.62
12a	room ambient	21.37	21.31	21.27			
13a	current (amps)	15.02	15.02	15.02			

Test 1b - thru Mfg. 2 10-amp breaker at 100% current (10A * 100% = 10A); max temps, reading every 60s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		129	134	139			
time (HH:MM:SS) →		2:06:07	2:11:06	2:16:07			
1b	Mfg. 10 - 1	31.13	31.54	31.37	9.64	10.05	9.88
2b	Mfg. 10 - 2	30.12	30.39	30.44	8.63	8.90	8.95
3b	Mfg. 10 - 3	28.95	29.13	29.19	7.46	7.64	7.70
4b	Mfg. 9 - 1	28.47	28.67	28.85	6.98	7.18	7.36
5b	Mfg. 9 - 2	28.62	29.01	28.85	7.13	7.52	7.36
6b	Mfg. 9 - 3	29.94	30.21	30.11	8.45	8.72	8.62
7b	circuit breaker	41.81	41.46	41.80	20.32	19.97	20.31
8b	line wire	31.66	31.83	32.15	10.17	10.34	10.66
9b	line wire splicing device	29.57	30.02	30.13	8.08	8.53	8.64
10b	load wire	28.92	29.64	29.57	7.43	8.15	8.08
11b	load wire splicing device	30.62	31.06	31.03	9.13	9.57	9.54
12b	room ambient	21.30	21.89	21.28			
13b	current (amps)	10.01	10.01	10.01			

Test 1b - thru Mfg. 2 15-amp breaker at 100% current (15A * 100% = 15A); max temps, reading every 60s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		122	127	132			
time (HH:MM:SS) →		2:00:00	2:05:00	2:10:00			
1b	Mfg. 10 - 1	39.02	38.87	38.81	17.86	17.72	17.65
2b	Mfg. 10 - 2	38.54	38.42	38.37	17.38	17.26	17.22
3b	Mfg. 10 - 3	35.00	34.94	34.56	13.84	13.78	13.40
4b	Mfg. 9 - 1	34.32	34.17	34.19	13.16	13.01	13.03
5b	Mfg. 9 - 2	33.68	33.52	33.44	12.52	12.36	12.29
6b	Mfg. 9 - 3	32.62	32.41	32.27	11.46	11.25	11.11
7b	circuit breaker	44.60	44.48	44.38	23.44	23.32	23.22
8b	line wire	33.27	33.12	33.14	12.11	11.96	11.98
9b	line wire splicing device	31.50	31.19	31.26	10.34	10.03	10.10
10b	load wire	31.96	31.65	31.72	10.81	10.49	10.56
11b	load wire splicing device	30.27	29.89	29.93	9.12	8.73	8.78
12b	room ambient	21.26	21.14	21.08			
13b	current (amps)	15.01	15.01	15.01			

Test 1c - thru Mfg. 3 10-amp breaker at 100% current (10A * 100% = 10A); max temps, reading every 60s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		67	72	77			
time (HH:MM:SS) →		1:04:00	1:09:00	1:14:00			
1c	Mfg. 10 - 1	31.05	30.92	30.45	9.04	8.91	8.44
2c	Mfg. 10 - 2	32.97	32.85	32.26	10.96	10.84	10.25
3c	Mfg. 10 - 3	29.07	28.94	28.28	7.06	6.93	6.27
4c	Mfg. 9 - 1	29.52	29.28	29.21	7.51	7.27	7.20
5c	Mfg. 9 - 2	30.06	29.90	29.40	8.05	7.89	7.39
6c	Mfg. 9 - 3	28.41	28.41	27.55	6.40	6.40	5.54
7c	circuit breaker	34.97	34.66	34.67	12.96	12.65	12.66
8c	line wire	31.77	31.18	30.88	9.76	9.17	8.87
9c	line wire splicing device	28.89	28.20	27.63	6.88	6.19	5.62
10c	load wire	31.27	30.69	30.26	9.26	8.68	8.25
11c	load wire splicing device	31.39	30.47	29.53	9.38	8.46	7.52
12c	room ambient	22.35	21.99	21.69			
13c	current (amps)	10.01	10.01	10.01			

Test 1c - thru Mfg. 3 15-amp breaker at 100% current (15A * 100% = 15A); max temps, reading every 60s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		122	127	132			
time (HH:MM:SS) →		2:00:00	2:05:00	2:10:00			
1c	Mfg. 10 - 1	36.19	35.94	35.85	15.02	14.77	14.68
2c	Mfg. 10 - 2	39.95	39.76	39.70	18.78	18.59	18.53
3c	Mfg. 10 - 3	39.01	39.15	38.69	17.85	17.98	17.52
4c	Mfg. 9 - 1	33.32	33.13	33.09	12.15	11.96	11.92
5c	Mfg. 9 - 2	34.01	33.90	33.74	12.84	12.74	12.57
6c	Mfg. 9 - 3	32.95	32.95	32.64	11.78	11.78	11.47
7c	circuit breaker	41.75	41.55	41.58	20.59	20.38	20.41
8c	line wire	30.73	30.68	30.61	9.56	9.51	9.44
9c	line wire splicing device	32.20	31.82	31.87	11.04	10.65	10.70
10c	load wire	31.34	31.12	31.14	10.17	9.95	9.97
11c	load wire splicing device	29.64	29.52	29.42	8.47	8.35	8.25
12c	room ambient	21.29	21.13	21.09			
13c	current (amps)	15.01	15.01	15.01			

Test 2a - thru Mfg. 1 10-amp breaker at 135% current (10A * 135% = 13.5A); max temps, reading every 20s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →							
time (MM:SS) →		7:20	7:40	8:00			
	Breaker trip time	8:20					
1a	Mfg. 11 - 1	30.60	30.69	30.76	8.65	8.73	8.80
2a	Mfg. 11 - 2	30.73	30.83	30.87	8.78	8.88	8.92
3a	Mfg. 11 - 3	29.72	29.82	29.85	7.76	7.87	7.89
4a	Mfg. 8 - 1	30.66	30.77	30.88	8.70	8.81	8.93
5a	Mfg. 8 - 2	30.87	30.96	31.05	8.91	9.01	9.09
6a	Mfg. 8 - 3	30.39	30.50	30.55	8.43	8.54	8.59
7a	circuit breaker	34.21	34.43	34.65	12.26	12.47	12.70
8a	line wire	38.55	38.70	38.80	16.59	16.74	16.85
9a	line wire splicing device	34.64	34.68	34.50	12.68	12.72	12.55
10a	load wire	36.44	36.44	36.36	14.49	14.48	14.40
11a	load wire splicing device	35.04	35.05	34.84	13.09	13.09	12.88
12a	room ambient	22.00	21.97	21.91			
13a	current (amps)	13.52	13.52	13.52			

Test 2a - thru Mfg. 1 15-amp breaker at 135% current (15A * 135% = 20.25A); max temps, reading every 20s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		60	61	62			
time (MM:SS) →		18:20	18:40	19:00			
	Breaker trip time	19:20					
1a	Mfg. 11 - 1	39.87	39.91	39.90	18.05	18.09	18.08
2a	Mfg. 11 - 2	40.66	40.69	40.70	18.84	18.87	18.88
3a	Mfg. 11 - 3	36.77	36.77	36.76	14.95	14.95	14.94
4a	Mfg. 8 - 1	40.83	40.88	40.89	19.01	19.06	19.07
5a	Mfg. 8 - 2	40.41	40.45	40.47	18.59	18.63	18.65
6a	Mfg. 8 - 3	39.06	39.09	39.15	17.24	17.27	17.33
7a	circuit breaker	51.78	51.96	52.02	29.96	30.14	30.20
8a	line wire	43.47	43.51	43.49	21.65	21.69	21.67
9a	line wire splicing device	48.83	48.80	48.22	27.02	26.99	26.40
10a	load wire	41.01	41.02	41.12	19.19	19.20	19.30
11a	load wire splicing device	42.69	42.60	42.48	20.87	20.78	20.66
12a	room ambient	21.84	21.84	21.78			
13a	current (amps)	19.97	19.97	20.24			

Test 2b - thru Mfg. 2 10-amp breaker at 135% current (10A * 135% = 13.5A); max temps, reading every 20s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		16	17	18			
time (MM:SS) →		4:20	4:40	5:00			
	Breaker trip time	5:20					
1b	Mfg. 11 - 1	29.25	29.41	29.55	6.91	7.07	7.21
2b	Mfg. 11 - 2	28.86	29.03	29.22	6.52	6.69	6.88
3b	Mfg. 11 - 3	28.34	28.44	28.54	6.00	6.10	6.20
4b	Mfg. 8 - 1	29.37	29.59	29.79	7.03	7.25	7.45
5b	Mfg. 8 - 2	30.27	30.43	30.67	7.93	8.09	8.33
6b	Mfg. 8 - 3	28.84	28.97	29.10	6.50	6.63	6.76
7b	circuit breaker	34.99	35.63	36.29	12.65	13.29	13.95
8b	line wire	34.20	34.58	34.92	11.86	12.24	12.58
9b	line wire splicing device	33.21	33.11	33.12	10.87	10.77	10.78
10b	load wire	30.95	31.14	31.38	8.61	8.80	9.04
11b	load wire splicing device	32.76	32.73	32.78	10.42	10.39	10.44
12b	room ambient	22.40	22.34	22.29			
13b	current (amps)	13.51	13.51	13.51			

Test 2b - thru Mfg. 2 15-amp breaker at 135% current (15A * 135% = 20.25A); max temps, reading every 20s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature		Rise (°C)
scan # →		13	14	15			
time (MM:SS) →		2:20	2:40	3:00			
	Breaker trip time	3:20					
1b	Mfg. 11 - 1	31.85	32.56	33.17	9.91	10.62	11.23
2b	Mfg. 11 - 2	31.27	32.00	32.64	9.33	10.05	10.70
3b	Mfg. 11 - 3	30.01	30.61	31.08	8.07	8.67	9.14
4b	Mfg. 8 - 1	31.78	32.43	33.07	9.84	10.49	11.13
5b	Mfg. 8 - 2	32.35	32.97	33.48	10.41	11.03	11.54
6b	Mfg. 8 - 3	31.74	32.37	32.83	9.80	10.42	10.89
7b	circuit breaker	36.50	38.10	39.50	14.56	16.16	17.56
8b	line wire	32.89	33.90	34.83	10.95	11.96	12.89
9b	line wire splicing device	34.98	35.61	36.11	13.04	13.67	14.17
10b	load wire	33.90	34.76	35.58	11.96	12.82	13.64
11b	load wire splicing device	35.84	36.48	37.04	13.90	14.54	15.10
12b	room ambient	21.94	21.93	21.96			
13b	current (amps)	20.28	20.27	20.27			

Test 2c - thru Mfg. 3 10-amp breaker at 135% current (10A * 135% = 13.5A); max temps, reading every 20s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		59	60	61			
time (MM:SS) →		18:40	19:00	19:20			
	Breaker trip time	19:40					
1c	Mfg. 11 - 1	34.08	34.15	34.18	11.70	11.78	11.81
2c	Mfg. 11 - 2	33.23	33.27	33.31	10.85	10.89	10.93
3c	Mfg. 11 - 3	31.22	31.25	31.28	8.85	8.87	8.90
4c	Mfg. 8 - 1	33.48	33.50	33.56	11.10	11.13	11.19
5c	Mfg. 8 - 2	32.68	32.75	32.80	10.31	10.37	10.42
6c	Mfg. 8 - 3	31.96	32.03	32.09	9.58	9.66	9.71
7c	circuit breaker	43.05	43.08	43.19	20.67	20.71	20.81
8c	line wire	38.04	38.09	38.14	15.67	15.72	15.76
9c	line wire splicing device	33.55	33.75	33.89	11.17	11.38	11.51
10c	load wire	37.55	37.62	37.70	15.17	15.24	15.33
11c	load wire splicing device	35.83	36.09	36.28	13.46	13.71	13.91
12c	room ambient	22.51	22.28	22.34			
13c	current (amps)	13.51	13.51	13.51			

Test 2c - thru Mfg. 3 15-amp breaker at 135% current (15A * 135% = 20.25A); max temps, reading every 20s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature		Rise (°C)
scan # →		20	21	22			
time (MM:SS) →		5:00	5:20	5:40			
	Breaker trip time	6:00					
1c	Mfg. 11 - 1	34.62	34.96	35.21	12.63	12.97	13.22
2c	Mfg. 11 - 2	35.65	35.96	36.17	13.65	13.97	14.18
3c	Mfg. 11 - 3	33.85	34.05	34.25	11.85	12.05	12.25
4c	Mfg. 8 - 1	34.94	35.23	35.47	12.95	13.24	13.48
5c	Mfg. 8 - 2	35.87	36.13	36.37	13.87	14.13	14.38
6c	Mfg. 8 - 3	34.38	34.60	34.74	12.38	12.61	12.75
7c	circuit breaker	42.69	43.47	44.15	20.69	21.47	22.16
8c	line wire	36.07	36.49	36.77	14.08	14.50	14.78
9c	line wire splicing device	38.93	39.23	39.49	16.94	17.24	17.49
10c	load wire	37.64	37.92	38.15	15.64	15.92	16.16
11c	load wire splicing device	35.65	35.84	35.95	13.66	13.85	13.96
12c	room ambient	21.95	22.09	21.93			
13c	current (amps)	20.19	20.19	20.17			

Test 2a - thru Mfg. 1 10-amp breaker at 135% current (10A * 135% = 13.5A); max temps, reading every 20s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		26	27	28			
time (MM:SS) →		7:40	8:00	8:20			
	Breaker trip time	8:40					
1a	Mfg. 10 - 1	33.38	33.55	33.72	11.54	11.72	11.89
2a	Mfg. 10 - 2	32.41	32.50	32.60	10.58	10.67	10.77
3a	Mfg. 10 - 3	30.50	30.58	30.68	8.66	8.75	8.85
4a	Mfg. 9 - 1	30.51	30.62	30.74	8.67	8.79	8.91
5a	Mfg. 9 - 2	30.63	30.73	30.86	8.80	8.89	9.02
6a	Mfg. 9 - 3	29.45	29.52	29.63	7.62	7.69	7.79
7a	circuit breaker	34.35	34.60	34.84	12.51	12.77	13.00
8a	line wire	38.69	38.85	39.02	16.85	17.01	17.18
9a	line wire splicing device	34.03	34.11	34.24	12.19	12.27	12.40
10a	load wire	36.42	36.48	36.58	14.59	14.65	14.74
11a	load wire splicing device	36.28	36.41	36.59	14.45	14.58	14.76
12a	room ambient	21.84	21.90	21.76			
13a	current (amps)	13.52	13.52	13.52			

Test 2a - thru Mfg. 1 15-amp breaker at 135% current (15A * 135% = 20.25A); max temps, reading every 20s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature		Rise (°C)
scan # →		65	66	67			
time (MM:SS) →		20:00	20:20	20:40			
	Breaker trip time	21:00					
1a	Mfg. 10 - 1	47.14	47.05	47.05	26.19	26.10	26.09
2a	Mfg. 10 - 2	49.33	49.35	49.30	28.38	28.39	28.35
3a	Mfg. 10 - 3	43.32	43.29	43.14	22.36	22.34	22.19
4a	Mfg. 9 - 1	45.67	45.67	45.73	24.72	24.71	24.78
5a	Mfg. 9 - 2	46.98	46.95	46.85	26.03	25.99	25.90
6a	Mfg. 9 - 3	38.91	38.80	38.65	17.95	17.84	17.69
7a	circuit breaker	52.18	52.30	52.40	31.23	31.34	31.45
8a	line wire	43.36	43.34	43.31	22.40	22.39	22.35
9a	line wire splicing device	46.95	46.94	46.87	26.00	25.99	25.91
10a	load wire	41.51	41.36	41.20	20.56	20.41	20.25
11a	load wire splicing device	42.93	42.85	42.57	21.97	21.89	21.62
12a	room ambient	20.94	20.94	20.98			
13a	current (amps)	20.29	20.28	20.28			

Test 2b - thru Mfg. 2 10-amp breaker at 135% current (10A * 135% = 13.5A); max temps, reading every 20s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		21	22	23			
time (MM:SS) →		5:40	6:00	6:20			
	Breaker trip time	6:40					
1b	Mfg. 10 - 1	31.86	32.13	32.38	9.94	10.21	10.46
2b	Mfg. 10 - 2	32.09	32.28	32.45	10.17	10.36	10.53
3b	Mfg. 10 - 3	30.06	30.24	30.38	8.14	8.32	8.46
4b	Mfg. 9 - 1	29.45	29.60	29.73	7.53	7.68	7.81
5b	Mfg. 9 - 2	30.16	30.32	30.49	8.23	8.40	8.57
6b	Mfg. 9 - 3	29.34	29.52	29.64	7.42	7.60	7.72
7b	circuit breaker	37.11	37.68	38.17	15.19	15.76	16.25
8b	line wire	35.37	35.59	35.81	13.44	13.67	13.88
9b	line wire splicing device	32.21	32.37	32.46	10.28	10.45	10.54
10b	load wire	31.36	31.58	31.73	9.44	9.66	9.80
11b	load wire splicing device	35.28	35.40	35.49	13.36	13.47	13.56
12b	room ambient	21.93	21.95	21.88			
13b	current (amps)	13.50	13.50	13.50			

Test 2b - thru Mfg. 2 15-amp breaker at 135% current (15A * 135% = 20.25A); max temps, reading every 20s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		13	14	15			
time (MM:SS) →		2:40	3:00	3:20			
	Breaker trip time	3:40					
1b	Mfg. 10 - 1	34.43	35.44	36.33	13.42	14.43	15.32
2b	Mfg. 10 - 2	35.56	36.51	37.33	14.56	15.51	16.33
3b	Mfg. 10 - 3	33.00	33.73	34.31	12.00	12.73	13.30
4b	Mfg. 9 - 1	32.70	33.42	34.00	11.69	12.41	13.00
5b	Mfg. 9 - 2	32.65	33.31	33.89	11.64	12.30	12.89
6b	Mfg. 9 - 3	30.85	31.44	31.99	9.85	10.43	10.98
7b	circuit breaker	36.44	37.96	39.35	15.44	16.96	18.34
8b	line wire	32.46	33.42	34.28	11.45	12.41	13.28
9b	line wire splicing device	35.23	35.84	36.40	14.22	14.84	15.39
10b	load wire	33.42	34.26	35.03	12.42	13.26	14.02
11b	load wire splicing device	33.28	33.92	34.50	12.27	12.91	13.49
12b	room ambient	20.93	21.01	21.08			
13b	current (amps)	20.28	20.28	20.28			

Test 2c - thru Mfg. 3 10-amp breaker at 135% current (10A * 135% = 13.5A); max temps, reading every 20s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		53	54	55			
time (MM:SS) →		16:20	16:40	17:00			
	Breaker trip time	17:20					
1c	Mfg. 10 - 1	35.58	35.62	35.62	13.37	13.41	13.41
2c	Mfg. 10 - 2	36.59	36.62	36.62	14.38	14.41	14.41
3c	Mfg. 10 - 3	32.94	32.95	32.98	10.73	10.74	10.77
4c	Mfg. 9 - 1	33.08	33.07	33.07	10.87	10.86	10.86
5c	Mfg. 9 - 2	33.95	33.93	33.90	11.73	11.72	11.69
6c	Mfg. 9 - 3	31.62	31.62	31.58	9.40	9.41	9.37
7c	circuit breaker	41.72	41.81	41.92	19.51	19.60	19.71
8c	line wire	38.68	38.60	38.52	16.47	16.39	16.31
9c	line wire splicing device	33.41	33.23	33.04	11.19	11.02	10.83
10c	load wire	37.53	37.41	37.27	15.31	15.20	15.06
11c	load wire splicing device	38.23	37.83	37.38	16.01	15.62	15.17
12c	room ambient	22.28	22.22	22.14			
13c	current (amps)	13.50	13.50	13.50			

Test 2c - thru Mfg. 3 15-amp breaker at 135% current (15A * 135% = 20.25A); max temps, reading every 20s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		22	23	24			
time (MM:SS) →		5:40	6:00	6:20			
	Breaker trip time	6:40					
1c	Mfg. 10 - 1	37.66	38.19	38.64	16.09	16.61	17.07
2c	Mfg. 10 - 2	44.95	45.50	45.96	23.38	23.93	24.39
3c	Mfg. 10 - 3	44.95	45.37	45.69	23.38	23.80	24.12
4c	Mfg. 9 - 1	35.48	35.83	36.20	13.90	14.26	14.63
5c	Mfg. 9 - 2	38.33	38.69	39.10	16.75	17.12	17.52
6c	Mfg. 9 - 3	36.86	37.22	37.59	15.28	15.65	16.02
7c	circuit breaker	42.83	43.50	44.14	21.26	21.93	22.56
8c	line wire	35.89	36.21	36.61	14.32	14.64	15.04
9c	line wire splicing device	40.91	41.17	41.52	19.33	19.60	19.95
10c	load wire	37.99	38.35	38.72	16.42	16.78	17.15
11c	load wire splicing device	39.30	39.51	39.86	17.72	17.93	18.29
12c	room ambient	21.55	21.59	21.59			
13c	current (amps)	20.30	20.26	20.27			

Appendix C3 Static Heating Tests at 150% Rated Current

Test 3a - thru Mfg. 1 10-amp breaker at 150% current (10A * 150% = 15A); max temps, reading every 10s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		19	20	21			
time (MM:SS)	→	2:00	2:10	2:20			
	Breaker trip time	2:30					
1a	Mfg. 11 - 1	27.90	28.21	28.45	5.51	5.83	6.06
2a	Mfg. 11 - 2	27.85	28.17	28.44	5.46	5.79	6.06
3a	Mfg. 11 - 3	27.44	27.71	27.97	5.05	5.32	5.58
4a	Mfg. 8 - 1	28.03	28.30	28.55	5.64	5.91	6.17
5a	Mfg. 8 - 2	28.67	28.93	29.21	6.28	6.55	6.83
6a	Mfg. 8 - 3	28.12	28.37	28.63	5.73	5.98	6.24
7a	circuit breaker	29.23	29.65	30.04	6.84	7.27	7.65
8a	line wire	33.45	33.99	34.55	11.06	11.60	12.16
9a	line wire splicing device	33.38	33.88	34.38	10.99	11.49	11.99
10a	load wire	32.35	32.80	33.28	9.96	10.41	10.89
11a	load wire splicing device	34.69	35.13	35.60	12.30	12.74	13.21
12a	room ambient	22.40	22.39	22.37			
13a	current (amps)	15.02	15.02	15.02			

Test 3a - thru Mfg. 1 15-amp breaker at 150% current (15A * 150% = 22.5A); max temps, reading every 10s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		31	32	33			
time (MM:SS)	→	3:40	3:50	4:00			
	Breaker trip time	4:10					
1a	Mfg. 11 - 1	36.08	36.34	36.60	13.46	13.72	13.98
2a	Mfg. 11 - 2	36.41	36.67	36.97	13.79	14.05	14.35
3a	Mfg. 11 - 3	34.72	34.88	35.08	12.10	12.26	12.46
4a	Mfg. 8 - 1	36.33	36.58	36.86	13.71	13.96	14.24
5a	Mfg. 8 - 2	37.14	37.38	37.62	14.53	14.76	15.00
6a	Mfg. 8 - 3	36.40	36.56	36.84	13.78	13.94	14.22
7a	circuit breaker	40.83	41.35	41.83	18.21	18.73	19.21
8a	line wire	39.85	40.31	40.75	17.23	17.69	18.13
9a	line wire splicing device	49.53	49.93	50.18	26.91	27.31	27.56
10a	load wire	40.21	40.60	40.99	17.60	17.98	18.37
11a	load wire splicing device	45.48	45.83	46.22	22.86	23.21	23.60
12a	room ambient	22.65	22.62	22.58			
13a	current (amps)	22.56	22.53	22.53			

Test 3b - thru Mfg. 2 10-amp breaker at 150% current (10A * 150% = 15A); max temps, reading every 10s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		19	20	21			
time (MM:SS)	→	2:00	2:10	2:20			
	Breaker trip time	2:30					
1b	Mfg. 11 - 1	28.11	28.40	28.72	5.67	5.96	6.28
2b	Mfg. 11 - 2	27.73	27.97	28.26	5.29	5.53	5.82
3b	Mfg. 11 - 3	27.57	27.80	28.05	5.12	5.36	5.60
4b	Mfg. 8 - 1	28.38	28.63	28.91	5.93	6.19	6.47
5b	Mfg. 8 - 2	29.23	29.50	29.82	6.79	7.06	7.37
6b	Mfg. 8 - 3	28.00	28.25	28.53	5.56	5.81	6.09
7b	circuit breaker	30.38	30.93	31.50	7.94	8.48	9.06
8b	line wire	31.30	31.79	32.30	8.85	9.34	9.86
9b	line wire splicing device	32.82	33.29	33.71	10.38	10.84	11.27
10b	load wire	28.66	29.10	29.50	6.21	6.66	7.06
11b	load wire splicing device	33.26	33.63	33.95	10.82	11.18	11.51
12b	room ambient	22.47	22.43	22.43			
13b	current (amps)	15.01	15.01	15.01			

Test 3b - thru Mfg. 2 15-amp breaker at 150% current (15A * 150% = 22.5A); max temps, reading every 10s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		13	14	15			
time (MM:SS)	→	:40	:50	1:00			
	Breaker trip time	1:10					
1b	Mfg. 11 - 1	26.84	27.76	28.60	4.39	5.31	6.15
2b	Mfg. 11 - 2	26.26	27.11	27.94	3.81	4.66	5.49
3b	Mfg. 11 - 3	26.03	26.75	27.44	3.58	4.30	4.99
4b	Mfg. 8 - 1	26.61	27.54	28.41	4.16	5.09	5.96
5b	Mfg. 8 - 2	27.59	28.55	29.46	5.14	6.10	7.01
6b	Mfg. 8 - 3	27.23	28.09	28.93	4.78	5.64	6.48
7b	circuit breaker	27.33	28.59	29.90	4.88	6.14	7.45
8b	line wire	26.59	27.53	28.44	4.14	5.08	5.99
9b	line wire splicing device	29.28	30.58	31.77	6.83	8.13	9.32
10b	load wire	27.88	28.93	29.91	5.43	6.48	7.46
11b	load wire splicing device	29.84	31.22	32.45	7.39	8.77	10.00
12b	room ambient	22.46	22.43	22.45			
13b	current (amps)	22.51	22.49	22.49			

Test 3c - thru Mfg. 3 10-amp breaker at 150% current (10A * 150% = 15A); max temps, reading every 10s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		37	38	39			
time (MM:SS) →		5:00	5:10	5:20			
	Breaker trip time	5:30					
1c	Mfg. 11 - 1	32.34	32.46	32.62	9.83	9.96	10.12
2c	Mfg. 11 - 2	31.80	31.94	32.06	9.30	9.44	9.56
3c	Mfg. 11 - 3	29.96	30.07	30.17	7.46	7.56	7.67
4c	Mfg. 8 - 1	31.82	31.94	32.07	9.32	9.44	9.57
5c	Mfg. 8 - 2	31.64	31.77	31.86	9.13	9.26	9.36
6c	Mfg. 8 - 3	31.07	31.17	31.31	8.57	8.67	8.81
7c	circuit breaker	37.24	37.53	37.80	14.74	15.03	15.30
8c	line wire	38.50	38.75	39.00	16.00	16.25	16.50
9c	line wire splicing device	35.73	35.83	35.94	13.23	13.33	13.43
10c	load wire	37.84	38.06	38.26	15.33	15.56	15.75
11c	load wire splicing device	38.75	38.81	38.93	16.24	16.31	16.43
12c	room ambient	22.50	22.49	22.52			
13c	current (amps)	15.01	15.01	15.01			

Test 3c - thru Mfg. 3 15-amp breaker at 150% current (15A * 150% = 22.5A); max temps, reading every 10s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		23	24	25			
time (MM:SS) →		2:20	2:30	2:40			
	Breaker trip time	2:50					
1c	Mfg. 11 - 1	32.80	33.29	33.73	10.40	10.89	11.33
2c	Mfg. 11 - 2	34.13	34.67	35.12	11.73	12.27	12.72
3c	Mfg. 11 - 3	32.29	32.77	33.17	9.89	10.37	10.77
4c	Mfg. 8 - 1	33.21	33.67	34.07	10.81	11.27	11.67
5c	Mfg. 8 - 2	34.62	35.08	35.48	12.22	12.68	13.08
6c	Mfg. 8 - 3	32.76	33.21	33.64	10.36	10.81	11.24
7c	circuit breaker	37.29	38.07	38.83	14.89	15.67	16.43
8c	line wire	33.28	33.93	34.55	10.88	11.53	12.15
9c	line wire splicing device	40.01	40.55	41.07	17.61	18.15	18.67
10c	load wire	36.15	36.74	37.30	13.75	14.34	14.90
11c	load wire splicing device	37.79	38.32	38.82	15.39	15.92	16.42
12c	room ambient	22.38	22.41	22.41			
13c	current (amps)	22.43	22.44	22.42			

Test 3a - thru Mfg. 1 10-amp breaker at 150% current (10A * 150% = 15A); max temps, reading every 10s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		23	24	25			
time (MM:SS) →		2:20	2:30	2:40			
	Breaker trip time	2:50					
1a	Mfg. 10 - 1	29.81	30.21	30.55	7.56	7.96	8.30
2a	Mfg. 10 - 2	29.70	30.02	30.29	7.44	7.77	8.04
3a	Mfg. 10 - 3	28.37	28.62	28.85	6.12	6.37	6.60
4a	Mfg. 9 - 1	28.22	28.46	28.69	5.97	6.21	6.44
5a	Mfg. 9 - 2	28.46	28.71	28.94	6.21	6.46	6.69
6a	Mfg. 9 - 3	27.73	27.96	28.13	5.48	5.71	5.88
7a	circuit breaker	29.83	30.21	30.53	7.58	7.96	8.28
8a	line wire	34.40	34.90	35.38	12.15	12.65	13.13
9a	line wire splicing device	32.53	32.88	33.18	10.28	10.63	10.93
10a	load wire	33.43	33.88	34.25	11.17	11.63	12.00
11a	load wire splicing device	37.25	37.47	37.66	15.00	15.22	15.41
12a	room ambient	22.28	22.24	22.24			
13a	current (amps)	15.02	15.02	15.02			

Test 3a - thru Mfg. 1 15-amp breaker at 150% current (15A * 150% = 22.5A); max temps, reading every 10s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		38	39	40			
time (MM:SS) →		4:00	4:10	4:20			
	Breaker trip time	4:30					
1a	Mfg. 10 - 1	40.53	40.89	41.27	18.74	19.10	19.48
2a	Mfg. 10 - 2	42.28	42.67	43.05	20.49	20.88	21.26
3a	Mfg. 10 - 3	39.25	39.54	39.81	17.46	17.75	18.02
4a	Mfg. 9 - 1	39.03	39.37	39.68	17.24	17.58	17.89
5a	Mfg. 9 - 2	40.06	40.40	40.75	18.27	18.61	18.96
6a	Mfg. 9 - 3	35.92	36.14	36.35	14.14	14.35	14.56
7a	circuit breaker	41.66	42.13	42.62	19.87	20.34	20.83
8a	line wire	40.15	40.56	40.91	18.36	18.77	19.12
9a	line wire splicing device	47.60	47.94	48.23	25.81	26.16	26.44
10a	load wire	40.83	41.12	41.46	19.04	19.33	19.67
11a	load wire splicing device	46.50	46.62	46.74	24.72	24.83	24.95
12a	room ambient	21.81	21.79	21.76			
13a	current (amps)	22.35	22.35	22.35			

Test 3b - thru Mfg. 2 10-amp breaker at 150% current (10A * 150% = 15A); max temps, reading every 10s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		21	22	23			
time (MM:SS) →		2:00	2:10	2:20			
	Breaker trip time	2:30					
1b	Mfg. 10 - 1	28.72	29.12	29.50	6.58	6.98	7.36
2b	Mfg. 10 - 2	29.55	29.94	30.33	7.41	7.80	8.19
3b	Mfg. 10 - 3	28.01	28.30	28.56	5.87	6.16	6.42
4b	Mfg. 9 - 1	27.72	28.02	28.27	5.58	5.88	6.13
5b	Mfg. 9 - 2	27.97	28.28	28.55	5.83	6.14	6.41
6b	Mfg. 9 - 3	27.58	27.82	28.09	5.44	5.68	5.95
7b	circuit breaker	30.55	31.13	31.74	8.41	8.99	9.60
8b	line wire	31.18	31.69	32.20	9.04	9.55	10.06
9b	line wire splicing device	31.46	31.83	32.14	9.32	9.69	10.00
10b	load wire	28.42	28.81	29.21	6.28	6.67	7.07
11b	load wire splicing device	36.24	36.63	36.93	14.10	14.49	14.79
12b	room ambient	22.20	22.13	22.09			
13b	current (amps)	15.00	15.00	15.00			

Test 3b - thru Mfg. 2 15-amp breaker at 150% current (15A * 150% = 22.5A); max temps, reading every 10s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		18	19	20			
time (MM:SS) →		:40	:50	1:00			
	Breaker trip time	1:10					
1b	Mfg. 10 - 1	25.84	26.82	27.77	4.13	5.12	6.06
2b	Mfg. 10 - 2	29.58	31.10	32.54	7.88	9.40	10.83
3b	Mfg. 10 - 3	32.64	34.09	35.41	10.93	12.39	13.71
4b	Mfg. 9 - 1	25.84	26.77	27.65	4.14	5.07	5.94
5b	Mfg. 9 - 2	27.74	28.90	29.94	6.03	7.19	8.24
6b	Mfg. 9 - 3	27.36	28.35	29.32	5.65	6.65	7.62
7b	circuit breaker	26.69	27.90	29.05	4.98	6.20	7.35
8b	line wire	25.29	26.13	26.94	3.59	4.42	5.23
9b	line wire splicing device	28.85	30.25	31.50	7.14	8.54	9.80
10b	load wire	27.35	28.42	29.40	5.65	6.72	7.70
11b	load wire splicing device	29.03	30.42	31.68	7.33	8.71	9.98
12b	room ambient	21.68	21.70	21.73			
13b	current (amps)	22.56	22.55	22.52			

Test 3c - thru Mfg. 3 10-amp breaker at 150% current (10A * 150% = 15A); max temps, reading every 10s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		44	45	46			
time (MM:SS) →		5:50	6:00	6:10			
	Breaker trip time	6:20					
1c	Mfg. 10 - 1	33.95	34.06	34.18	12.26	12.38	12.49
2c	Mfg. 10 - 2	34.86	35.03	35.17	13.17	13.34	13.48
3c	Mfg. 10 - 3	32.06	32.16	32.23	10.37	10.47	10.55
4c	Mfg. 9 - 1	31.67	31.77	31.89	9.98	10.08	10.20
5c	Mfg. 9 - 2	31.89	31.99	32.07	10.20	10.30	10.39
6c	Mfg. 9 - 3	30.51	30.58	30.63	8.82	8.89	8.94
7c	circuit breaker	37.51	37.73	37.94	15.82	16.04	16.25
8c	line wire	38.17	38.32	38.46	16.48	16.63	16.77
9c	line wire splicing device	33.48	33.53	33.58	11.79	11.84	11.89
10c	load wire	37.25	37.38	37.51	15.57	15.70	15.82
11c	load wire splicing device	39.05	39.08	39.09	17.36	17.39	17.40
12c	room ambient	21.68	21.69	21.69			
13c	current (amps)	15.00	15.00	15.00			

Test 3c - thru Mfg. 3 15-amp breaker at 150% current (15A * 150% = 22.5A); max temps, reading every 10s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		28	29	30			
time (MM:SS) →		2:20	2:30	2:40			
	Breaker trip time	2:50					
1c	Mfg. 10 - 1	28.08	27.72	27.38	6.22	5.87	5.53
2c	Mfg. 10 - 2	27.85	27.43	27.08	5.99	5.58	5.23
3c	Mfg. 10 - 3	26.82	26.45	26.13	4.97	4.59	4.27
4c	Mfg. 9 - 1	26.62	26.30	26.02	4.76	4.45	4.17
5c	Mfg. 9 - 2	26.78	26.44	26.12	4.92	4.58	4.27
6c	Mfg. 9 - 3	26.00	25.71	25.47	4.15	3.86	3.62
7c	circuit breaker	30.09	29.81	29.54	8.23	7.95	7.68
8c	line wire	27.46	27.28	27.08	5.61	5.42	5.22
9c	line wire splicing device	27.03	26.55	26.12	5.18	4.69	4.26
10c	load wire	27.36	27.10	26.84	5.50	5.24	4.98
11c	load wire splicing device	27.70	27.09	26.53	5.84	5.23	4.67
12c	room ambient	21.89	21.86	21.82			
13c	current (amps)	22.40	22.39	22.39			

Test 4a - thru Mfg. 1 10-amp breaker at 200% current (10A * 200% = 20A); max temps, reading every 7s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		10	11	12			
time (MM:SS) →		:15	:21	:28			
	Breaker trip time	:35					
1a	Mfg. 11 - 1	24.11	24.67	25.32	2.07	2.62	3.28
2a	Mfg. 11 - 2	24.06	24.59	25.25	2.02	2.55	3.20
3a	Mfg. 11 - 3	24.07	24.57	25.16	2.03	2.52	3.12
4a	Mfg. 8 - 1	24.08	24.69	25.40	2.03	2.64	3.35
5a	Mfg. 8 - 2	24.66	25.33	26.11	2.61	3.28	4.06
6a	Mfg. 8 - 3	24.22	24.83	25.55	2.17	2.79	3.50
7a	circuit breaker	24.11	24.82	25.62	2.07	2.77	3.57
8a	line wire	27.40	28.75	30.11	5.35	6.71	8.06
9a	line wire splicing device	25.44	26.76	28.29	3.40	4.72	6.24
10a	load wire	26.61	27.77	28.96	4.57	5.72	6.91
11a	load wire splicing device	26.63	28.24	30.08	4.59	6.20	8.04
12a	room ambient	22.05	22.06	22.03			
13a	current (amps)	19.99	20.01	20.01			

Test 4a - thru Mfg. 1 15-amp breaker at 200% current (15A * 200% = 30A); max temps, reading every 7s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		20	21	22			
time (MM:SS) →		:28	:35	:42			
	Breaker trip time	:49					
1a	Mfg. 11 - 1	27.71	28.87	30.04	5.22	6.37	7.55
2a	Mfg. 11 - 2	27.71	28.87	30.05	5.22	6.38	7.56
3a	Mfg. 11 - 3	27.95	28.97	30.04	5.46	6.47	7.54
4a	Mfg. 8 - 1	27.60	28.90	30.19	5.11	6.40	7.70
5a	Mfg. 8 - 2	28.56	29.91	31.25	6.06	7.42	8.76
6a	Mfg. 8 - 3	29.13	30.23	31.51	6.63	7.73	9.02
7a	circuit breaker	27.85	29.29	30.80	5.35	6.80	8.30
8a	line wire	29.17	30.44	31.74	6.68	7.95	9.24
9a	line wire splicing device	36.20	38.78	41.38	13.71	16.28	18.89
10a	load wire	29.69	31.07	32.48	7.20	8.58	9.98
11a	load wire splicing device	36.64	39.18	41.65	14.14	16.69	19.15
12a	room ambient	22.48	22.48	22.52			
13a	current (amps)	29.87	29.79	29.76			

Test 4b - thru Mfg. 2 10-amp breaker at 200% current (10A * 200% = 20A); max temps, reading every 7s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		10	11	12			
time (MM:SS) →		:15	:21	:28			
	Breaker trip time	:35					
1b	Mfg. 11 - 1	23.92	24.53	25.23	2.00	2.60	3.30
2b	Mfg. 11 - 2	23.87	24.40	25.03	1.95	2.48	3.10
3b	Mfg. 11 - 3	24.04	24.56	25.19	2.11	2.64	3.27
4b	Mfg. 8 - 1	24.03	24.67	25.43	2.11	2.74	3.51
5b	Mfg. 8 - 2	24.81	25.54	26.38	2.89	3.62	4.46
6b	Mfg. 8 - 3	24.09	24.69	25.38	2.17	2.77	3.46
7b	circuit breaker	23.99	24.68	25.52	2.07	2.75	3.60
8b	line wire	25.64	26.65	27.71	3.72	4.73	5.78
9b	line wire splicing device	25.15	26.44	27.96	3.22	4.52	6.03
10b	load wire	23.65	24.33	25.10	1.73	2.41	3.18
11b	load wire splicing device	26.05	27.55	29.19	4.13	5.63	7.27
12b	room ambient	21.94	21.92	21.90			
13b	current (amps)	20.00	20.00	20.00			

Test 4b - thru Mfg. 2 15-amp breaker at 200% current (15A * 200% = 30A); max temps, reading every 7s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		16	17	18			
time (MM:SS) →		:00	:09	:15			
	Breaker trip time	:21					
1b	Mfg. 11 - 1	22.78	24.58	25.64	0.28	2.08	3.14
2b	Mfg. 11 - 2	22.55	23.95	24.94	0.05	1.45	2.44
3b	Mfg. 11 - 3	22.78	24.32	25.15	0.28	1.82	2.65
4b	Mfg. 8 - 1	22.67	24.22	25.26	0.17	1.72	2.76
5b	Mfg. 8 - 2	23.01	25.35	26.56	0.52	2.85	4.06
6b	Mfg. 8 - 3	23.06	25.22	26.32	0.57	2.72	3.83
7b	circuit breaker	22.89	24.64	25.66	0.39	2.15	3.17
8b	line wire	22.78	24.14	25.26	0.28	1.64	2.76
9b	line wire splicing device	22.80	25.27	27.08	0.30	2.77	4.59
10b	load wire	22.73	25.29	26.72	0.23	2.79	4.22
11b	load wire splicing device	22.84	25.76	27.75	0.34	3.26	5.26
12b	room ambient	22.49	22.49	22.51			
13b	current (amps)	29.72	29.67	29.65			

Test 4c - thru Mfg. 3 10-amp breaker at 200% current (10A * 200% = 20A); max temps, reading every 7s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		16	17	18			
time (MM:SS) →		:56	1:03	1:10			
	Breaker trip time	1:17					
1c	Mfg. 11 - 1	27.91	28.45	29.02	5.96	6.50	7.07
2c	Mfg. 11 - 2	27.83	28.34	28.85	5.88	6.39	6.90
3c	Mfg. 11 - 3	26.46	26.84	27.26	4.51	4.89	5.31
4c	Mfg. 8 - 1	28.33	28.89	29.46	6.38	6.94	7.51
5c	Mfg. 8 - 2	28.77	29.28	29.81	6.82	7.33	7.86
6c	Mfg. 8 - 3	27.76	28.25	28.71	5.81	6.30	6.76
7c	circuit breaker	30.95	31.72	32.52	8.99	9.77	10.56
8c	line wire	32.07	32.86	33.68	10.12	10.91	11.73
9c	line wire splicing device	31.50	32.36	33.19	9.54	10.41	11.24
10c	load wire	32.53	33.29	34.09	10.58	11.34	12.14
11c	load wire splicing device	36.35	37.44	38.34	14.40	15.49	16.39
12c	room ambient	22.03	21.91	21.92			
13c	current (amps)	20.00	20.00	20.00			

Test 4c - thru Mfg. 3 15-amp breaker at 200% current (15A * 200% = 30A); max temps, reading every 7s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		18	19	20			
time (MM:SS) →		:15	:21	:28			
	Breaker trip time	:35					
1c	Mfg. 11 - 1	24.86	25.82	26.97	2.56	3.52	4.67
2c	Mfg. 11 - 2	25.87	27.00	28.27	3.57	4.70	5.97
3c	Mfg. 11 - 3	25.45	26.38	27.49	3.15	4.08	5.19
4c	Mfg. 8 - 1	25.11	26.19	27.48	2.81	3.89	5.18
5c	Mfg. 8 - 2	26.49	27.73	29.14	4.19	5.43	6.85
6c	Mfg. 8 - 3	25.08	26.08	27.24	2.78	3.78	4.94
7c	circuit breaker	25.44	26.60	28.04	3.14	4.30	5.74
8c	line wire	24.49	25.44	26.52	2.20	3.15	4.22
9c	line wire splicing device	27.39	29.24	31.37	5.09	6.95	9.07
10c	load wire	26.18	27.74	29.43	3.88	5.44	7.13
11c	load wire splicing device	26.21	27.89	29.79	3.91	5.59	7.49
12c	room ambient	22.31	22.30	22.29			
13c	current (amps)	29.59	29.78	29.83			

Test 4a - thru Mfg. 1 10-amp breaker at 200% current (10A * 200% = 20A); max temps, reading every 7s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		27	28	29			
time (MM:SS) →		:15	:21	:28			
	Breaker trip time	:35					
1a	Mfg. 10 - 1	24.20	24.89	25.74	2.53	3.23	4.07
2a	Mfg. 10 - 2	24.11	24.81	25.65	2.45	3.14	3.99
3a	Mfg. 10 - 3	23.82	24.42	25.12	2.16	2.76	3.45
4a	Mfg. 9 - 1	23.70	24.28	24.96	2.04	2.62	3.29
5a	Mfg. 9 - 2	23.89	24.51	25.23	2.22	2.84	3.57
6a	Mfg. 9 - 3	23.66	24.22	24.90	1.99	2.55	3.23
7a	circuit breaker	23.81	24.47	25.29	2.14	2.80	3.63
8a	line wire	26.99	28.37	29.76	5.32	6.71	8.09
9a	line wire splicing device	24.05	25.15	26.46	2.39	3.48	4.79
10a	load wire	26.61	27.85	29.13	4.94	6.19	7.47
11a	load wire splicing device	28.24	30.24	32.42	6.58	8.58	10.75
12a	room ambient	21.68	21.67	21.66			
13a	current (amps)	20.02	20.03	20.03			

Test 4a - thru Mfg. 1 15-amp breaker at 200% current (15A * 200% = 30A); max temps, reading every 7s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		17	18	19			
time (MM:SS) →		:28	:35	:42			
	Breaker trip time	:49					
1a	Mfg. 10 - 1	27.27	28.75	30.17	5.77	7.24	8.67
2a	Mfg. 10 - 2	28.89	30.53	32.07	7.38	9.02	10.56
3a	Mfg. 10 - 3	27.89	29.33	30.74	6.38	7.82	9.24
4a	Mfg. 9 - 1	27.16	28.54	29.90	5.66	7.04	8.39
5a	Mfg. 9 - 2	28.09	29.55	30.97	6.58	8.05	9.46
6a	Mfg. 9 - 3	27.93	29.14	30.27	6.43	7.64	8.77
7a	circuit breaker	26.82	28.27	29.71	5.32	6.77	8.20
8a	line wire	28.15	29.45	30.67	6.65	7.95	9.17
9a	line wire splicing device	34.08	36.63	38.99	12.57	15.13	17.49
10a	load wire	28.54	29.95	31.29	7.03	8.45	9.79
11a	load wire splicing device	35.97	38.68	41.18	14.47	17.17	19.67
12a	room ambient	21.49	21.52	21.51			
13a	current (amps)	29.88	29.83	29.82			

Test 4b - thru Mfg. 2 10-amp breaker at 200% current (10A * 200% = 20A); max temps, reading every 7s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		27	28	29			
time (MM:SS) →		:15	:21	:28			
	Breaker trip time	:35					
1b	Mfg. 10 - 1	23.68	24.31	25.08	2.15	2.79	3.55
2b	Mfg. 10 - 2	24.00	24.79	25.66	2.47	3.26	4.13
3b	Mfg. 10 - 3	23.96	24.59	25.27	2.43	3.06	3.74
4b	Mfg. 9 - 1	23.67	24.25	24.93	2.14	2.73	3.40
5b	Mfg. 9 - 2	23.75	24.36	25.10	2.22	2.84	3.58
6b	Mfg. 9 - 3	23.79	24.37	25.03	2.26	2.84	3.50
7b	circuit breaker	23.69	24.36	25.21	2.16	2.84	3.69
8b	line wire	25.34	26.37	27.40	3.81	4.84	5.88
9b	line wire splicing device	24.37	25.54	26.91	2.84	4.01	5.38
10b	load wire	23.38	24.06	24.84	1.86	2.54	3.32
11b	load wire splicing device	28.62	30.57	32.60	7.09	9.05	11.07
12b	room ambient	21.54	21.54	21.50			
13b	current (amps)	19.99	19.99	19.99			

Test 4b - thru Mfg. 2 15-amp breaker at 200% current (15A * 200% = 30A); max temps, reading every 7s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		13	14	15			
time (MM:SS) →		0:00	:09	:15			
	Breaker trip time	:21					
1b	Mfg. 10 - 1	21.91	23.26	24.56	0.52	1.87	3.16
2b	Mfg. 10 - 2	21.93	24.79	26.37	0.54	3.40	4.97
3b	Mfg. 10 - 3	21.91	23.93	25.26	0.52	2.54	3.87
4b	Mfg. 9 - 1	21.95	24.22	25.49	0.56	2.83	4.10
5b	Mfg. 9 - 2	21.93	24.57	25.87	0.54	3.18	4.48
6b	Mfg. 9 - 3	21.90	24.12	25.30	0.51	2.73	3.90
7b	circuit breaker	22.03	23.68	24.72	0.64	2.28	3.33
8b	line wire	22.07	23.08	24.22	0.68	1.69	2.83
9b	line wire splicing device	21.89	24.14	26.27	0.50	2.75	4.87
10b	load wire	21.93	24.17	25.69	0.54	2.78	4.30
11b	load wire splicing device	21.95	26.40	28.99	0.56	5.01	7.60
12b	room ambient	21.40	21.38	21.40			
13b	current (amps)	30.03	29.98	29.94			

Test 4c - thru Mfg. 3 10-amp breaker at 200% current (10A * 200% = 20A); max temps, reading every 7s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		33	34	35			
time (MM:SS) →		:56	1:03	1:10			
	Breaker trip time	1:17					
1c	Mfg. 10 - 1	28.89	29.56	30.22	7.33	8.01	8.67
2c	Mfg. 10 - 2	29.13	29.80	30.47	7.57	8.25	8.92
3c	Mfg. 10 - 3	28.24	28.82	29.43	6.69	7.27	7.87
4c	Mfg. 9 - 1	27.96	28.54	29.11	6.41	6.98	7.56
5c	Mfg. 9 - 2	27.95	28.55	29.13	6.40	6.99	7.58
6c	Mfg. 9 - 3	27.87	28.37	28.89	6.31	6.82	7.34
7c	circuit breaker	30.46	31.20	31.96	8.91	9.65	10.41
8c	line wire	31.76	32.54	33.32	10.20	10.99	11.77
9c	line wire splicing device	30.32	31.15	31.96	8.77	9.60	10.41
10c	load wire	32.17	32.94	33.69	10.62	11.39	12.14
11c	load wire splicing device	39.40	40.57	41.66	17.85	19.02	20.11
12c	room ambient	21.59	21.54	21.53			
13c	current (amps)	20.00	20.00	20.00			

Test 4c - thru Mfg. 3 15-amp breaker at 200% current (15A * 200% = 30A); max temps, reading every 7s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		16	17	18			
time (MM:SS) →		:21	:28	:35			
	Breaker trip time	:42					
1c	Mfg. 10 - 1	24.57	25.84	27.05	3.19	4.45	5.67
2c	Mfg. 10 - 2	28.42	30.54	32.56	7.04	9.16	11.18
3c	Mfg. 10 - 3	33.47	35.78	37.86	12.09	14.40	16.48
4c	Mfg. 9 - 1	24.87	26.08	27.27	3.49	4.70	5.89
5c	Mfg. 9 - 2	27.04	28.63	30.11	5.66	7.25	8.73
6c	Mfg. 9 - 3	26.95	28.35	29.72	5.57	6.97	8.34
7c	circuit breaker	25.75	27.15	28.60	4.37	5.77	7.22
8c	line wire	24.57	25.65	26.68	3.19	4.27	5.30
9c	line wire splicing device	27.76	29.81	31.74	6.38	8.43	10.35
10c	load wire	26.52	28.22	29.72	5.14	6.84	8.34
11c	load wire splicing device	27.66	29.85	31.88	6.28	8.47	10.49
12c	room ambient	21.40	21.37	21.36			
13c	current (amps)	29.34	29.29	30.17			

Test 1b - thru Mfg. 2 10-amp breaker at 100% current (10A * 100% = 10A); max temps, reading every 60s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		67	72	77			
time (HH:MM:SS)	→	1:04:00	1:09:00	1:14:00			
1b	Mfg. 10 - 1	33.66	33.62	33.48	12.17	12.13	11.99
2b	Mfg. 10 - 2	30.46	30.56	30.61	8.97	9.07	9.12
3b	Mfg. 10 - 3	28.97	29.03	28.87	7.48	7.54	7.38
4b	Mfg. 9 - 1	28.59	28.61	28.68	7.10	7.12	7.19
5b	Mfg. 9 - 2	29.99	29.94	29.81	8.50	8.45	8.32
6b	Mfg. 9 - 3	28.44	28.40	28.15	6.95	6.91	6.66
7b	circuit breaker	41.26	41.48	41.60	19.77	19.99	20.11
8b	line wire	31.15	30.97	30.89	9.66	9.48	9.40
9b	line wire splicing device	28.63	28.27	28.01	7.14	6.78	6.52
10b	load wire	28.45	28.20	28.09	6.96	6.71	6.60
11b	load wire splicing device	30.47	29.94	29.87	8.98	8.45	8.38
12b	room ambient	22.46	22.07	21.66			
13b	current (amps)	10.01	10.01	10.01			

Test 2b - thru Mfg. 2 10-amp breaker at 135% current (10A * 135% = 13.5A); max temps, reading every 20s

data logger CH #	Location	Recorded Temperatures (°C)			Calculated Temperature Rise (°C)		
scan # →		202	203	204			
time (MM:SS)	→	66:20	66:40	67:00			
	Breaker trip time	> 67 mins. (no trip)					
1b	Mfg. 10 - 1	40.89	40.89	40.88	18.96	18.97	18.96
2b	Mfg. 10 - 2	37.03	37.03	37.04	15.11	15.11	15.12
3b	Mfg. 10 - 3	34.24	34.26	34.21	12.31	12.34	12.29
4b	Mfg. 9 - 1	33.52	33.50	33.53	11.60	11.58	11.61
5b	Mfg. 9 - 2	35.79	35.78	35.75	13.87	13.86	13.83
6b	Mfg. 9 - 3	33.44	33.45	33.39	11.52	11.53	11.47
7b	circuit breaker	56.60	56.56	56.59	34.68	34.64	34.67
8b	line wire	38.73	38.68	38.65	16.81	16.76	16.72
9b	line wire splicing device	33.69	33.57	33.57	11.76	11.65	11.65
10b	load wire	33.57	33.50	33.50	11.65	11.57	11.58
11b	load wire splicing device	37.08	36.99	37.04	15.16	15.07	15.12
12b	room ambient	22.10	22.03	21.97			
13b	current (amps)	13.49	13.49	13.49			

Appendix D Flexing Tests

Conductor Flexing tests on 14-2 AWG copper-clad aluminum NMB cable:

test #	wire connection method	pass / fail (10x flexion)	comments
6-1	wrap around terminal screw	pass	ends of hot and neutral wires broke when removing them from their terminals after the test
6-2	single compression	pass	
6-3	double compression	pass	
6-1-1	wrap around terminal screw	failed	retest of 6-1; hot wire (black) broke on 8th flexion
6-1-2	wrap around terminal screw	pass	retest of 6-1 using copper wire
6-1-3	wrap around terminal screw	pass	retest of 6-1

NOTE: One Legrand receptacle was used for all 3 tests above and 9in/lbs was applied to all three terminal screws.

PACIFIC TEST AND MEASUREMENT

PO Box 2363, Clackamas, OR 97015
15648 114th Ave. Suite 109, Clackamas OR 97015
Phone: 503-406-4373 Fax: 503 905 0457
www.pacifictestandmeasurement.com

Certificate of Conformance

Issued to:	CDCMello Consulting LLC PO Box 872317 Vancouver, WA 98687
Customer PO:	Verbal Chuck Mello
Model:	UL3055
Lot Number:	952103-019
Report:	JK202006300-003
Description:	Type J, 30 Gauge FEP/FEP Teflon, Special Limits of Error Tolerance, 15 feet length, Thermocouple

Pacific Test and Measurement Inc certifies that the order of thermocouples meets all applicable instructions, specifications, and in accordance with DAP UL 00-OP-C0037 version 10.0. The preferred method of welding to produce a single point weld or bead using ThermX model 258B welder has been used to assemble the thermocouple junction which has been proven as reliable and repeatable through validation. The finish products were assembled from UL4047, a spool of described wire calibrated to accredited standards as described in the calibration report.

Certified by: _____ Date: ___7-10-2020_____
(Quality Department)

ACCREDITED
CERT #2496.01

Report of Calibration

Eustis Co.,Inc./Pyrocom Calibration lab
12407-B Mukilteo Speedway #200
Lynnwood, wa 98087

Report No: JK202006300-003

Model: UL4047 Serial: 952103-019 Description: TYPE J, 30AWG, FEP/FEP	Customer: . .
Calibration Range: Limited Received Condition: New Current: N/A Procedure: ECP 339/341	CDCMello Consulting LLC PO Box 872317 Vancouver, WA 98687

The unit under test (UUT) on this certificate has been calibrated by comparison method as covered by ASTM E220-13, and calibrated against standards traceable to the National Institute of Standards and Technology (NIST). Eustis Co., Inc./Pyrocom Calibration Lab meets the requirements of ANSI/NCSL Z540-1-1994 and ISO/IEC 17025 and is accredited by A2LA via Certificate Number 2496.01 for calibrations within the scope to which it applies. The uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2. All results contained within this certificate relate only to the item calibrated. Any number of factors may cause the calibrated item to drift out of calibration.

Nominal Value (Set-point) (C)	Actual Value (Reference) (C)	UUT (Test Sensor) (C)	Error (C)	Measurement Uncertainty (C)	Method of Realization
21.00	21.41	21.38	-0.03	+/- 0.31	COMP
40.00	40.08	40.02	-0.06	+/- 0.40	COMP
95.00	95.02	94.97	-0.05	+/- 0.40	COMP
150.00	150.02	150.10	0.08	+/- 0.50	COMP
200.00	200.01	200.23	0.22	+/- 0.50	COMP

Test Equipment

Manufacturer	Model	Description	Serial Number	Recall Date
Hart Scientific	1560	"Black Stack" Base Unit	96539	NCR
Hart Scientific	2560	SPRT Module	A25631	3/24/2021
Fluke	5628	4 Wire SPRT	4303	3/26/2021
Fluke	2566	Thermocouple Scanner	B7A380	3/24/2021
Fluke	9173	Metrology Well, 700 C	B47975	NCR
Fluke	7380	Bath, Ultra Low-Temperature	B2A527	NCR

Calibration Date: 6/18/2020
Temperature: 23.0 C
Humidity: 47%
Customer Order: 74523

Technician: Julia Kulin

Approved By: Walter Paulson
QA Manager

Report of Calibration

Notes: The thermocouple wire meets or exceeds the criteria established for type "J" SPECIAL LIMITS OF ERROR per ASTM E230/E230M-17 table 1 & ISA-MC96.1-1982 Par. 2.5 Table 8 +/- 1.1°C OR +/- .4% whichever is greater. Lot calibration data supplied for your reference.
Calibrated item meets special limits of error for all results given according to the comparison of "error" reading to the specifications found in ASTM E230/E230M-17 table 1 & MC96.1-1982 table 8; acceptance determination is ultimately the responsibility of the customer, taking into account all uncertainties and other factors. The closer the results are to the specification limits, the greater the risk that the unit under test will be out of tolerance.

Report issue date: JUN 19 2020

Fox Valley Metrology
3114 Medalist Drive
Oshkosh, WI 54902
(920) 426-5894 • Fax (920) 426-8120
http://www.FoxValleyMetrology.com

CERTIFICATE OF CALIBRATION

ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY
Certificate No. ACT-1272

Certification Number CK198-33105-466

For Eaton Corporation - ICD
W126 N7250 Flint Drive
Menomonee Falls, WI 53051

Purchase Order #	4044-671109
Test Instrument	Data Acquisition Unit
Make	Keysight
Model	34972A
Serial Number	MY49002695
Identification	EM7054
Customer Location	ICD
Condition Received	In Tolerance
Condition Returned	In Tolerance
Calibrated By	Alex Paulsen
Technical Review By	Tim Bending
Calibration Location	FVM
Calibration Conditions	67.8°F, 19.9°C, 57.3%RH
Calibration Date	07/16/2020
Recalibration Due	07/16/2021

Procedures Followed
FVE-000 rev. 2
FVE-006 rev. 2

Form Revision 6: 02/04/2012

Standards Used

Instrument	Serial Number	Trace Number	Next Cal
FVS-275A	RY11838	CJ191-70508-513	07/28/2020
FVS-737	4542903	CK041-57440-531	02/28/2021

Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. (This is considered "shared responsibility.") Uncertainties expressed in nominal units.

All instruments have been calibrated against standards traceable to NIST. Calibration was completed in accordance with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 and ANSI/NCSL Z540.3-2006. Other standards listed upon request.

* denotes "Out of Tolerance"

Calibration Results

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
Root Difference Square guardbanding method used.						
UUT IDENTIFICATION						
Serial Number: MY49002695 Firmware Level: 1.11-1.12-02-01						
INPUT MODULE CHARACTERISTICS						
Model: 34901A Firmware Level: 2.3						
SELF TEST				Pass	Pass	

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Certificate No. ACT-1272

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
INTERNAL DMM VERIFICATION						
ZERO OFFSET VERIFICATION						
DC CURRENT						
10 mA Range						
0.00000 mA	0.00000	-0.00200	0.00200	0.00003	0.00003	0.000007
100 mA Range						
0.0000 mA	0.0000	-0.0050	0.0050	0.0000	0.0000	0.00006
1 A Range						
0.000000 A	0.000000	-0.000100	0.000100	0.000001	0.000001	0.0000006
DC VOLTS						
100 mV Range						
0.0000 mV	0.0000	-0.0040	0.0040	0.0004	0.0004	0.00007
1 V Range						
0.000000 V	0.000000	-0.000007	0.000007	0.000001	0.000001	0.0000007
10 V Range						
0.00000 V	0.00000	-0.00005	0.00005	0.00000	0.00000	0.000007
100 V Range						
0.0000 V	0.0000	-0.0006	0.0006	0.0000	0.0000	0.00006
300 V Range						
0.000 V	0.000	-0.009	0.009	0.000	0.000	0.0006
2 WIRE □						
100 □ Range						
0.0000 Ohm	0.0000	-4.0040	4.0040	0.0626	0.0626	0.00007
1 k□ Range						
0.000000 kOhm	0.000000	-0.004010	0.004010	0.000065	0.000065	0.0000006
10 k□ Range						
0.00000 kOhm	0.00000	-0.00410	0.00410	0.00008	0.00008	0.000006
100 k□ Range						
0.0000 kOhm	0.0000	-0.0050	0.0050	0.0002	0.0002	0.00007
1 M□ Range						
0.000000 MOhm	0.000000	-0.000014	0.000014	0.000000	0.000000	0.0000007
10 M□ Range						

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Certificate No. ACT-1272

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
0.00000 MOhm	0.00000	-0.00010	0.00010	0.00000	0.00000	0.000007
100 M? Range						
0.0000 MOhm	0.0000	-0.0100	0.0100	0.0000	0.0000	0.00006
4 WIRE □						
100 □ Range						
0.0000 Ohm	0.0000	-0.0040	0.0040	-0.0023	-0.0023	0.00006
1 k□ Range						
0.000000 kOhm	0.000000	-0.000010	0.000010	0.000000	0.000000	0.0000006
10 k□ Range						
0.00000 kOhm	0.00000	-0.00010	0.00010	0.00000	0.00000	0.000007
100 k□ Range						
0.0000 kOhm	0.0000	-0.0010	0.0010	0.0000	0.0000	0.00007
1 M□ Range						
0.000000 MOhm	0.000000	-0.000010	0.000010	0.000000	0.000000	0.0000006
10 M□ Range						
0.00000 MOhm	0.00000	-0.00010	0.00010	0.00000	0.00000	0.000006
100 M□ Range						
0.0000 MOhm	0.0000	-0.0100	0.0100	0.0000	0.0000	0.00007
GAIN VERIFICATION						
DC VOLTS						
100 mV Range						
100.0000 mV	100.0000	99.9910	100.0090	100.0000	100.0000	0.00006
-100.0000 mV	-100.0000	-100.0090	-99.9910	-99.9987	-99.9987	0.00007
1 V Range						
1.000000 V	1.000000	0.999953	1.000047	0.999993	0.999993	0.0000007
-1.000000 V	-1.000000	-1.000047	-0.999953	-0.999989	-0.999989	0.0000007
10 V Range						
10.00000 V	10.00000	9.99960	10.00040	9.99994	9.99994	0.000006
-10.00000 V	-10.00000	-10.00040	-9.99960	-9.99992	-9.99992	0.000006
100 V Range						
100.0000 V	100.0000	99.9949	100.0051	99.9996	99.9996	0.00007
-100.0000 V	-100.0000	-100.0051	-99.9949	-99.9993	-99.9993	0.00007
300 V Range						
300.000 V	300.000	299.978	300.022	299.998	299.998	0.0006

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Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
2 WIRE □						
100 □ Range						
100.0000 Ohm	100.0000	95.9860	104.0140	100.0067	100.0067	0.00007
1 k□ Range						
1.000000 kOhm	1.000000	0.995890	1.004110	1.000032	1.000032	0.0000006
10 k□ Range						
10.00000 kOhm	10.00000	9.99490	10.00510	10.00035	10.00035	0.000007
100 k□ Range						
100.0000 kOhm	100.0000	99.9850	100.0150	100.0029	100.0029	0.00006
1 M□ Range						
1.000000 MOhm	1.000000	0.999886	1.000114	1.000016	1.000016	0.0000006
10 M□ Range						
10.00000 MOhm	10.00000	9.99590	10.00410	9.99768	9.99768	0.000006
100 M□ Range						
100.0000 MOhm	100.0000	99.1900	100.8100	100.3688	100.3688	0.00007
4 WIRE □						
100 □ Range						
100.0000 Ohm	100.0000	99.9860	100.0140	100.0039	100.0039	0.00006
1 k□ Range						
1.000000 kOhm	1.000000	0.999890	1.000110	1.000030	1.000030	0.0000007
10 k□ Range						
10.00000 kOhm	10.00000	9.99890	10.00110	10.00032	10.00032	0.000006
100 k□ Range						
100.0000 kOhm	100.0000	99.9890	100.0110	100.0021	100.0021	0.00007
1 M□ Range						
1.000000 MOhm	1.000000	0.999890	1.000110	0.999970	0.999970	0.0000007
10 M□ Range						
10.00000 MOhm	10.00000	9.99590	10.00410	9.99595	9.99595	0.000006
100 M□ Range						
100.0000 MOhm	100.0000	99.1900	100.8100	99.8275	99.8275	0.00006
DC CURRENT						
10 mA Range						
10.00000 mA	10.00000	9.99300	10.00700	9.99898	9.99898	0.000007
-10.00000 mA	-10.00000	-10.00700	-9.99300	-9.99887	-9.99887	0.000007

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CERTIFICATE OF CALIBRATION

ACCREDITED ISO IEC 17025 CALIBRATION AND TESTING LABORATORY
Certificate No. ACT-1272

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
100 mA Range						
100.0000 mA	100.0000	99.9450	100.0550	99.9882	99.9882	0.00006
-100.0000 mA	-100.0000	-100.0550	-99.9450	-99.9879	-99.9879	0.00006
1 A Range						
1.000000 A	1.000000	0.998900	1.001100	0.999534	0.999534	0.0000006
-1.000000 A	-1.000000	-1.001100	-0.998900	-0.999537	-0.999537	0.0000006
AC VOLTS						
100 mV Range						
10.0000 mV @ 1 kHz	10.0000	9.9540	10.0460	9.9997	9.9997	0.00006
100.0000 mV @ 1 kHz	100.0000	99.9000	100.1000	99.9912	99.9912	0.00006
100.0000 mV @ 50 kHz	100.0000	99.8300	100.1700	99.9383	99.9383	0.00006
1 V Range						
1.000000 V @ 20 Hz	1.000000	0.999000	1.001000	0.999803	0.999803	0.0000006
1.000000 V @ 1 kHz	1.000000	0.999000	1.001000	0.999950	0.999950	0.0000006
1.000000 V @ 20 kHz	1.000000	0.999000	1.001000	0.999888	0.999888	0.0000006
1.000000 V @ 50 kHz	1.000000	0.998300	1.001700	0.999504	0.999504	0.0000007
1.000000 V @ 100 kHz	1.000000	0.993200	1.006800	0.998811	0.998811	0.0000006
1.000000 V @ 200 kHz	1.000000	0.955000	1.045000	0.999068	0.999068	0.0000006
1.000000 V @ 250 kHz	1.000000	0.955000	1.045000	0.999202	0.999202	0.0000007
1.000000 V @ 300 kHz	1.000000	0.955000	1.045000	0.998797	0.998797	0.0000006
10 V Range						
0.10000 V @ 1 kHz	0.10000	0.08594	0.11406	0.10086	0.10086	0.000006
1.00000 V @ 1 kHz	1.00000	0.99540	1.00460	0.99992	0.99992	0.000006
10.00000 V @ 10 Hz	10.00000	9.99000	10.01000	9.99743	9.99743	0.000007
10.00000 V @ 1 kHz	10.00000	9.99000	10.01000	9.99855	9.99855	0.000006
10.00000 V @ 50 kHz	10.00000	9.98300	10.01700	9.99499	9.99499	0.000006
100 V Range						
100.0000 V @ 1 kHz	100.0000	99.9000	100.1000	99.9653	99.9653	0.00006
100.0000 V @ 50 kHz	100.0000	99.8300	100.1700	99.8943	99.8943	0.00006

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Certificate No. ACT-1272

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
300 V Range						
300.000 V @ 1 kHz	300.000	299.580	300.420	299.884	299.884	0.0006
200.000 V @ 50 kHz	200.000	199.400	200.600	199.750	199.750	0.0007
AC CURRENT						
10 mA Range						
10.00000 mA @ 1 kHz	10.00000	9.98600	10.01400	9.99766	9.99766	0.000007
100 mA Range						
100.0000 mA @ 1 kHz	100.0000	99.4000	100.6000	99.9484	99.9484	0.00007
1 A Range						
0.010000 A @ 1 kHz	0.010000	0.008590	0.011410	0.009960	0.009960	0.0000007
1.000000 A @ 1 kHz	1.000000	0.998600	1.001400	0.999502	0.999502	0.0000006
FREQUENCY						
100 Hz Range						
100.0000 Hz	100.0000	99.9000	100.1000	100.0056	100.0056	0.00007
100 kHz Range						
100.0000 kHz	100.0000	99.9900	100.0100	100.0001	100.0001	0.00007

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CERTIFICATE OF CALIBRATION

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Certificate No. ACT-1272

Certification Number CK198-39504-466

For Eaton Corporation - ICD
W126 N7250 Flint Drive
Menomonee Falls, WI 53051

Purchase Order #	4044-671109
Test Instrument	Multimeter Digital Multimeter
Make	Fluke
Model	179
Serial Number	77840008
Identification	EM4437
Customer Location	ICD
Condition Received	In Tolerance
Condition Returned	In Tolerance
Calibrated By	Alex Paulsen
Technical Review By	Tim Bending
Calibration Location	FVM
Calibration Conditions	68.3°F, 20.2°C, 56.2%RH
Calibration Date	07/16/2020
Recalibration Due	07/16/2021

Procedures Followed
FVE-000 rev. 2
FVE-001 rev. 2

Form Revision 6: 02/04/2012

Standards Used

Instrument	Serial Number	Trace Number	Next Cal
FVS-275A	RY11838	CJ191-70508-513	07/28/2020
FVS-737	4542903	CK041-57440-531	02/28/2021

Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. (This is considered "shared responsibility.") Uncertainties expressed in base units.

All instruments have been calibrated against standards traceable to NIST. Calibration was completed in accordance with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 and ANSI/NCSL Z540.3-2006. Other standards listed upon request.

Calibration Results

* denotes "Out of Tolerance"

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
AC VOLTS						
600 mV Range						
300.0 mV @ 45 Hz	300.0	296.7	303.3	299.2	299.2	0.07
6 V Range						
5.000 V @ 500 Hz	5.000	4.947	5.053	4.987	4.987	0.0007
5.000 V @ 1 kHz	5.000	4.897	5.103	4.949	4.949	0.0007
60 V Range						
50.00 V @ 45 Hz	50.00	49.47	50.53	49.98	49.98	0.007
50.00 V @ 1 kHz	50.00	48.97	51.03	50.02	50.02	0.007
600 V Range						
300.0 V @ 45 Hz	300.0	296.7	303.3	299.9	299.9	0.07
500.0 V @ 500 Hz	500.0	494.7	505.3	500.5	500.5	0.06
500.0 V @ 1 kHz	500.0	489.7	510.3	500.5	500.5	0.06
1000 V Range						
1000 V @ 45 Hz	1000	987	1013	1002	1002	0.7

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Certificate No. ACT-1272

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
AC VOLTS						
FREQUENCY						
45.00 Hz @ 1 V	45.00	44.95	45.06	45.01	45.01	0.007
50.00 kHz @ 5 V	50.00	49.94	50.06	50.00	50.00	0.006
DC VOLTAGE						
6 V Range						
5.000 V	5.000	4.994	5.007	4.997	4.997	0.0006
600 V Range						
300.0 V	300.0	299.5	300.5	299.8	299.8	0.06
1000 V Range						
1000 V	1000	997	1004	999	999	0.6
-1000 V	-1000	-1004	-997	-1000	-1000	0.7
DC VOLTS						
FREQUENCY						
45.00 Hz @ 3 V	45.00	44.95	45.06	45.01	45.01	0.007
50.00 kHz @ 30 V	50.00	49.94	50.06	50.00	50.00	0.007
DC MILLIVOLTS						
30.0 mV	30.0	29.8	30.2	30.0	30.0	0.06
-300.0 mV	-300.0	-300.5	-299.5	-299.9	-299.9	0.06
600.0 mV	600.0	599.3	600.7	599.7	599.7	0.07
TEMPERATURE						
0.0 °C	0.0	-1.0	1.0	1.0	1.0	0.06
-40.0 °C	-40.0	-41.4	-38.6	-39.0	-39.0	0.07
400.0 °C	400.0	395.0	405.0	400.9	400.9	0.06
OHMS						
600 Ohm Range						
19.0 Ohm	19.0	18.6	19.4	19.3	19.3	0.07
50 MOhm Range						
19.00 MOhm	19.00	18.68	19.32	19.00	19.00	0.006
CAPACITANCE						
1000 nF Range						
900 nF	900	887	913	899	899	0.6
CONTINUITY						
0 Ohms: Beeper On				Pass	Pass	
190 Ohms: Beeper Off				Pass	Pass	
DIODE TEST						

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CERTIFICATE OF CALIBRATION

Certificate No. ACT-1272

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
2.000 V	2.000	1.978	2.022	2.000	2.000	0.0007
AC MILLIAMPS						
60 mA Range						
3.00 mA @ 45 Hz	3.00	2.92	3.08	3.00	3.00	0.007
50.00 mA @ 1 kHz	50.00	49.22	50.78	50.06	50.06	0.006
400 mA Range						
400.0 mA @ 1 kHz	400.0	393.7	406.3	400.4	400.4	0.07
AC AMPS						
6 A Range						
4.000 A @ 45 Hz	4.000	3.937	4.063	4.005	4.005	0.0007
10A Range						
9.00 A @ 1 kHz	9.00	8.84	9.16	9.04	9.04	0.007
DC MILLIAMPS						
60 mA Range						
3.00 mA	3.00	2.94	3.06	3.00	3.00	0.006
50.00 mA	50.00	49.47	50.53	49.92	49.92	0.007
400 mA Range						
-400.0 mA	-400.0	-404.3	-395.7	-399.8	-399.8	0.07
DC AMPS						
6 A Range						
4.000 A	4.000	3.957	4.043	3.999	3.999	0.0007
10 A Range						
-9.00 A	-9.00	-9.12	-8.88	-9.01	-9.01	0.006

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CERTIFICATE OF CALIBRATION

ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY
Certificate No. ACT-1272

Certification Number CK198-38060-466

For Eaton Corporation - ICD
W126 N7250 Flint Drive
Menomonee Falls, WI 53051

Purchase Order #	4044-671109
Test Instrument	Multimeter Digital Multimeter
Make	Fluke
Model	175
Serial Number	13700492
Identification	EM7014
Customer Location	ICD
Condition Received	In Tolerance
Condition Returned	In Tolerance
Calibrated By	Alex Paulsen
Technical Review By	Tim Bending
Calibration Location	FVM
Calibration Conditions	68.2°F, 20.1°C, 56.6%RH
Calibration Date	07/16/2020
Recalibration Due	07/16/2021

Procedures Followed
FVE-000 rev. 2
FVE-001 rev. 2

Form Revision 6: 02/04/2012

Standards Used

Instrument	Serial Number	Trace Number	Next Cal
FVS-275A	RY11838	CJ191-70508-513	07/28/2020
FVS-737	4542903	CK041-57440-531	02/28/2021

Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. (This is considered "shared responsibility.") Uncertainties expressed in base units.

All instruments have been calibrated against standards traceable to NIST. Calibration was completed in accordance with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 and ANSI/NCSL Z540.3-2006. Other standards listed upon request.

Calibration Results

* denotes "Out of Tolerance"

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
AC VOLTS						
600 mV Range						
300.0 mV @ 45 Hz	300.0	296.7	303.3	299.9	299.9	0.07
6 V Range						
5.000 V @ 500 Hz	5.000	4.947	5.053	4.994	4.994	0.0007
5.000 V @ 1 kHz	5.000	4.897	5.103	4.955	4.955	0.0006
60 V Range						
50.00 V @ 45 Hz	50.00	49.47	50.53	49.94	49.94	0.007
50.00 V @ 1 kHz	50.00	48.97	51.03	50.06	50.06	0.006
600 V Range						
300.0 V @ 45 Hz	300.0	296.7	303.3	299.8	299.8	0.07
500.0 V @ 500 Hz	500.0	494.7	505.3	500.4	500.4	0.07
500.0 V @ 1 kHz	500.0	489.7	510.3	500.4	500.4	0.06
1000 V Range						
1000 V @ 45 Hz	1000	987	1013	996	996	0.6

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Certificate No. ACT-1272

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
AC VOLTS						
FREQUENCY						
45.00 Hz @ 1 V	45.00	44.95	45.06	45.00	45.00	0.007
50.00 kHz @ 5 V	50.00	49.94	50.06	50.00	50.00	0.007
DC VOLTAGE						
6 V Range						
5.000 V	5.000	4.990	5.010	5.000	5.000	0.0007
600 V Range						
300.0 V	300.0	299.4	300.6	300.0	300.0	0.06
1000 V Range						
1000 V	1000	997	1004	1000	1000	0.7
-1000 V	-1000	-1004	-997	-1000	-1000	0.7
DC VOLTS						
FREQUENCY						
45.00 Hz @ 3 V	45.00	44.95	45.06	45.00	45.00	0.007
50.00 kHz @ 30 V	50.00	49.94	50.06	50.00	50.00	0.007
DC MILLIVOLTS						
30.0 mV	30.0	29.8	30.2	30.0	30.0	0.07
-300.0 mV	-300.0	-300.6	-299.4	-299.9	-299.9	0.06
600.0 mV	600.0	598.9	601.1	599.9	599.9	0.06
OHMS						
600 Ohm Range						
19.0 Ohm	19.0	18.6	19.4	19.0	19.0	0.07
50 MOhm Range						
19.00 MOhm	19.00	18.68	19.32	18.99	18.99	0.006
CAPACITANCE						
1000 nF Range						
900 nF	900	887	913	900	900	0.7
CONTINUITY						
0 Ohms: Beeper On				Pass	Pass	
190 Ohms: Beeper Off				Pass	Pass	
DIODE TEST						
2.000 V	2.000	1.978	2.022	2.001	2.001	0.0006
AC MILLIAMPS						
60 mA Range						

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Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
3.00 mA @ 45 Hz	3.00	2.92	3.08	3.01	3.01	0.007
50.00 mA @ 1 kHz	50.00	49.22	50.78	49.96	49.96	0.007
400 mA Range						
400.0 mA @ 1 kHz	400.0	393.7	406.3	399.4	399.4	0.06
AC AMPS						
6 A Range						
4.000 A @ 45 Hz	4.000	3.937	4.063	3.997	3.997	0.0007
10A Range						
9.00 A @ 1 kHz	9.00	8.84	9.16	9.00	9.00	0.007
DC MILLIAMPS						
60 mA Range						
3.00 mA	3.00	2.94	3.06	3.02	3.02	0.006
50.00 mA	50.00	49.47	50.53	49.99	49.99	0.006
400 mA Range						
-400.0 mA	-400.0	-404.3	-395.7	-400.0	-400.0	0.07
DC AMPS						
6 A Range						
4.000 A	4.000	3.957	4.043	3.999	3.999	0.0007
10 A Range						
-9.00 A	-9.00	-9.12	-8.88	-9.00	-9.00	0.007

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CERTIFICATE OF CALIBRATION

ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY
Certificate No. ACT-1272

Certification Number CK198-38779-466

For Eaton Corporation - ICD
W126 N7250 Flint Drive
Menomonee Falls, WI 53051

Purchase Order #	4044-671109
Test Instrument	Multimeter Digital Multimeter
Make	Fluke
Model	179
Serial Number	14370601
Identification	EM7024
Customer Location	ICD
Condition Received	In Tolerance
Condition Returned	In Tolerance
Calibrated By	Alex Paulsen
Technical Review By	Tim Bending
Calibration Location	FVM
Calibration Conditions	68.2°F, 20.1°C, 56.6%RH
Calibration Date	07/16/2020
Recalibration Due	07/16/2021

Procedures Followed
FVE-000 rev. 2
FVE-001 rev. 2

Form Revision 6: 02/04/2012

Standards Used

Instrument	Serial Number	Trace Number	Next Cal
FVS-275A	RY11838	CJ191-70508-513	07/28/2020
FVS-737	4542903	CK041-57440-531	02/28/2021

Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. (This is considered "shared responsibility.") Uncertainties expressed in nominal units.

All instruments have been calibrated against standards traceable to NIST. Calibration was completed in accordance with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 and ANSI/NCSL Z540.3-2006. Other standards listed upon request.

Calibration Results

* denotes "Out of Tolerance"

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
AC VOLTS						
600 mV Range						
300.0 mV @ 45 Hz	300.0	296.7	303.3	300.0	300.0	0.06
6 V Range						
5.000 V @ 500 Hz	5.000	4.947	5.053	4.997	4.997	0.0006
5.000 V @ 1 kHz	5.000	4.897	5.103	4.961	4.961	0.0006
60 V Range						
50.00 V @ 45 Hz	50.00	49.47	50.53	49.97	49.97	0.006
50.00 V @ 1 kHz	50.00	48.97	51.03	50.10	50.10	0.007
600 V Range						
300.0 V @ 45 Hz	300.0	296.7	303.3	300.0	300.0	0.07
500.0 V @ 500 Hz	500.0	494.7	505.3	500.9	500.9	0.06
500.0 V @ 1 kHz	500.0	489.7	510.3	500.8	500.8	0.06
1000 V Range						
1000 V @ 45 Hz	1000	987	1013	997	997	0.7

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CERTIFICATE OF CALIBRATION

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Certificate No. ACT-1272

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
AC VOLTS						
FREQUENCY						
45.00 Hz @ 1 V	45.00	44.95	45.06	45.00	45.00	0.007
50.00 kHz @ 5 V	50.00	49.94	50.06	50.00	50.00	0.006
DC VOLTAGE						
6 V Range						
5.000 V	5.000	4.994	5.007	5.000	5.000	0.0006
600 V Range						
300.0 V	300.0	299.5	300.5	299.9	299.9	0.06
1000 V Range						
1000 V	1000	997	1004	1000	1000	0.7
-1000 V	-1000	-1004	-997	-1000	-1000	0.7
DC VOLTS						
FREQUENCY						
45.00 Hz @ 3 V	45.00	44.95	45.06	45.00	45.00	0.007
50.00 kHz @ 30 V	50.00	49.94	50.06	50.00	50.00	0.006
DC MILLIVOLTS						
30.0 mV	30.0	29.8	30.2	30.0	30.0	0.06
-300.0 mV	-300.0	-300.5	-299.5	-299.9	-299.9	0.06
600.0 mV	600.0	599.3	600.7	599.8	599.8	0.06
TEMPERATURE						
0.0 °C	0.0	-1.0	1.0	0.5	0.5	0.06
-40.0 °C	-40.0	-41.4	-38.6	-39.3	-39.3	0.06
400.0 °C	400.0	395.0	405.0	400.4	400.4	0.06
OHMS						
600 Ohm Range						
19.0 Ohm	19.0	18.6	19.4	19.0	19.0	0.06
50 MOhm Range						
19.00 MOhm	19.00	18.68	19.32	18.98	18.98	0.006
CAPACITANCE						
1000 nF Range						
900 nF	900	887	913	900	900	0.6
CONTINUITY						
0 Ohms: Beeper On				Pass	Pass	
190 Ohms: Beeper Off				Pass	Pass	
DIODE TEST						

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Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
2.000 V	2.000	1.978	2.022	2.001	2.001	0.0007
AC MILLIAMPS						
60 mA Range						
3.00 mA @ 45 Hz	3.00	2.92	3.08	3.02	3.02	0.006
50.00 mA @ 1 kHz	50.00	49.22	50.78	50.03	50.03	0.006
400 mA Range						
400.0 mA @ 1 kHz	400.0	393.7	406.3	399.9	399.9	0.06
AC AMPS						
6 A Range						
4.000 A @ 45 Hz	4.000	3.937	4.063	4.004	4.004	0.0006
10A Range						
9.00 A @ 1 kHz	9.00	8.84	9.16	9.01	9.01	0.007
DC MILLIAMPS						
60 mA Range						
3.00 mA	3.00	2.94	3.06	3.01	3.01	0.007
50.00 mA	50.00	49.47	50.53	49.99	49.99	0.007
400 mA Range						
-400.0 mA	-400.0	-404.3	-395.7	-399.9	-399.9	0.06
DC AMPS						
6 A Range						
4.000 A	4.000	3.957	4.043	3.998	3.998	0.0006
10 A Range						
-9.00 A	-9.00	-9.12	-8.88	-9.00	-9.00	0.007

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CERTIFICATE OF CALIBRATION

ilac-MRA ANAB ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY
Certificate No. ACT-1272

Certification Number CK198-41226-466

For Eaton Corporation - ICD
W126 N7250 Flint Drive
Menomonee Falls, WI 53051

Purchase Order #	4044-671109
Test Instrument	Clamp Meter
Make	AEMC
Model	SR759
Serial Number	224137GKDV
Identification	EM6996
Customer Location	ICD
Condition Received	In Tolerance
Condition Returned	In Tolerance
Calibrated By	Alex Paulsen
Technical Review By	Tim Bending
Calibration Location	FVM
Calibration Conditions	67.8°F, 19.9°C, 56.3%RH
Calibration Date	07/16/2020
Recalibration Due	07/16/2021

Procedures Followed
FVE-007 rev. 2

Form Revision 6: 02/04/2012

Standards Used

Instrument	Serial Number	Trace Number	Next Cal
FVS-275A	RY11838	CJ191-70508-513	07/28/2020
FVS-546	24560221	CK093-41519-573	04/30/2021
FVS-737	4542903	CK041-57440-531	02/28/2021

Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. (This is considered "shared responsibility.") Uncertainties expressed in nominal units.

All instruments have been calibrated against standards traceable to NIST. Calibration was completed in accordance with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 and ANSI/NCSL Z540.3-2006. Other standards listed upon request.

Calibration Results

* denotes "Out of Tolerance"

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
1A Range; 1000mV/A @60 Hz	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)
10 mA	10.0	8.7	11.3	10.1	10.1	0.07
100 mA	100.0	96.0	104.0	101.3	101.3	0.06
500 mA	500.0	495.5	504.5	504.5	504.5	0.06
	(V AC)	(V AC)	(V AC)	(V AC)	(V AC)	(V AC)
1 A	1.000	0.992	1.008	1.008	1.008	0.0006
10A Range; 100mV/A @60 Hz	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)
100 mA	10.0	9.7	10.3	10.0	10.0	0.07
1 A	100.0	99.3	100.7	100.4	100.4	0.07
5 A	500.0	497.5	502.5	501.8	501.8	0.06
	(V AC)	(V AC)	(V AC)	(V AC)	(V AC)	(V AC)
10 A	1.000	0.995	1.005	1.004	1.004	0.0007
100A Range; 10mV/A @60 Hz	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)
1 A	10.0	9.7	10.3	10.0	10.0	0.07
10 A	100.0	99.3	100.7	100.1	100.1	0.06

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Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
50 A	500.0 (V AC)	498.5 (V AC)	501.5 (V AC)	500.3 (V AC)	500.3 (V AC)	0.06 (V AC)
100 A	1.000	0.998	1.002	1.001	1.001	0.0006
1000A Range; 1mV/A @60 Hz	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)
10 A	10.0	9.7	10.3	10.0	10.0	0.06
100 A	100.0	99.3	100.7	100.1	100.1	0.07
500 A	500.0	499.0	501.0	500.5	500.5	0.07
900 A	900.0	898.0	902.0	901.2	901.2	0.07

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CERTIFICATE OF CALIBRATION

ilac-MRA ANAB ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY
Certificate No. ACT-1272

Certification Number CK198-40179-466

For Eaton Corporation - ICD
W126 N7250 Flint Drive
Menomonee Falls, WI 53051

Purchase Order #	4044-671109
Test Instrument	Clamp Meter
Make	AEMC
Model	SR759
Serial Number	224139GKDV
Identification	EM6997
Customer Location	ICD
Condition Received	In Tolerance
Condition Returned	In Tolerance
Calibrated By	Alex Paulsen
Technical Review By	Tim Bending
Calibration Location	FVM
Calibration Conditions	67.8°F, 19.9°C, 56.3%RH
Calibration Date	07/16/2020
Recalibration Due	07/16/2021

Procedures Followed
FVE-007 rev. 2

Form Revision 6: 02/04/2012

Standards Used

Instrument	Serial Number	Trace Number	Next Cal
FVS-275A	RY11838	CJ191-70508-513	07/28/2020
FVS-546	24560221	CK093-41519-573	04/30/2021
FVS-737	4542903	CK041-57440-531	02/28/2021

Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. (This is considered "shared responsibility.") Uncertainties expressed in nominal units.

All instruments have been calibrated against standards traceable to NIST. Calibration was completed in accordance with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 and ANSI/NCSL Z540.3-2006. Other standards listed upon request.

Calibration Results

* denotes "Out of Tolerance"

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
1A Range; 1000mV/A @60 Hz	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)
10 mA	10.0	8.7	11.3	10.1	10.1	0.06
100 mA	100.0	96.0	104.0	101.1	101.1	0.06
500 mA	500.0	495.5	504.5	504.5	504.5	0.06
	(V AC)	(V AC)	(V AC)	(V AC)	(V AC)	(V AC)
1 A	1.000	0.992	1.008	1.008	1.008	0.0006
10A Range; 100mV/A @60 Hz	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)
100 mA	10.0	9.7	10.3	10.0	10.0	0.07
1 A	100.0	99.3	100.7	100.2	100.2	0.06
5 A	500.0	497.5	502.5	500.9	500.9	0.06
	(V AC)	(V AC)	(V AC)	(V AC)	(V AC)	(V AC)
10 A	1.000	0.995	1.005	1.002	1.002	0.0006
100A Range; 10mV/A @60 Hz	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)
1 A	10.0	9.7	10.3	10.0	10.0	0.06
10 A	100.0	99.3	100.7	100.1	100.1	0.07

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Certificate No. ACT-1272

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
50 A	500.0 (V AC)	498.5 (V AC)	501.5 (V AC)	500.1 (V AC)	500.1 (V AC)	0.06 (V AC)
100 A	1.000	0.998	1.002	1.001	1.001	0.0006
1000A Range; 1mV/A @60 Hz	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)
10 A	10.0	9.7	10.3	10.0	10.0	0.07
100 A	100.0	99.3	100.7	100.1	100.1	0.06
500 A	500.0	499.0	501.0	500.3	500.3	0.06
900 A	900.0	898.0	902.0	901.4	901.4	0.06

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CERTIFICATE OF CALIBRATION

ilac-MRA ANAB ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY
Certificate No. ACT-1272

Certification Number CK198-41583-466

For Eaton Corporation - ICD
W126 N7250 Flint Drive
Menomonee Falls, WI 53051

Purchase Order #	4044-671109
Test Instrument	Clamp Meter
Make	AEMC
Model	SR759
Serial Number	239584HKDV
Identification	EM8032
Customer Location	ICD
Condition Received	In Tolerance
Condition Returned	In Tolerance
Calibrated By	Alex Paulsen
Technical Review By	Tim Bending
Calibration Location	FVM
Calibration Conditions	67.8°F, 19.9°C, 56.3%RH
Calibration Date	07/16/2020
Recalibration Due	07/16/2021

Procedures Followed
FVE-007 rev. 2

Form Revision 6: 02/04/2012

Standards Used

Instrument	Serial Number	Trace Number	Next Cal
FVS-275A	RY11838	CJ191-70508-513	07/28/2020
FVS-546	24560221	CK093-41519-573	04/30/2021
FVS-737	4542903	CK041-57440-531	02/28/2021

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All instruments have been calibrated against standards traceable to NIST. Calibration was completed in accordance with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 and ANSI/NCSL Z540.3-2006. Other standards listed upon request.

Calibration Results

* denotes "Out of Tolerance"

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
1A Range; 1000mV/A @60 Hz	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)
10 mA	10.0	8.7	11.3	10.2	10.2	0.07
100 mA	100.0	96.0	104.0	101.1	101.1	0.07
500 mA	500.0	495.5	504.5	504.3	504.3	0.06
	(V AC)	(V AC)	(V AC)	(V AC)	(V AC)	(V AC)
1 A	1.000	0.992	1.008	1.007	1.007	0.0007
10A Range; 100mV/A @60 Hz	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)
100 mA	10.0	9.7	10.3	10.0	10.0	0.07
1 A	100.0	99.3	100.7	100.2	100.2	0.07
5 A	500.0	497.5	502.5	500.7	500.7	0.06
	(V AC)	(V AC)	(V AC)	(V AC)	(V AC)	(V AC)
10 A	1.000	0.995	1.005	1.002	1.002	0.0006
100A Range; 10mV/A @60 Hz	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)
1 A	10.0	9.7	10.3	10.0	10.0	0.07
10 A	100.0	99.3	100.7	100.0	100.0	0.07

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Certificate No. ACT-1272

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
50 A	500.0 (V AC)	498.5 (V AC)	501.5 (V AC)	500.0 (V AC)	500.0 (V AC)	0.07 (V AC)
100 A	1.000	0.998	1.002	1.000	1.000	0.0007
1000A Range; 1mV/A @60 Hz	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)
10 A	10.0	9.7	10.3	10.0	10.0	0.07
100 A	100.0	99.3	100.7	100.0	100.0	0.06
500 A	500.0	499.0	501.0	500.3	500.3	0.07
900 A	900.0	898.0	902.0	900.6	900.6	0.07

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CERTIFICATE OF CALIBRATION

ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY
Certificate No. ACT-1272

Certification Number CK196-72143-379

For Eaton Corporation - ICD
W126 N7250 Flint Drive
Menomonee Falls, WI 53051

Purchase Order #	4044-671109
Test Instrument	Torque Wrench
Make	CDI
Model	1502LDIN (3%)
Serial Number	0312910937
Identification	EM8363
Customer Location	ICD
Condition Received	In Tolerance
Condition Returned	In Tolerance
Calibrated By	Jim Peterson
Technical Review By	Kevin Dehne
Calibration Location	FVM
Calibration Conditions	69.0°F, 20.6°C, 54.2%RH
Calibration Date	07/14/2020
Recalibration Due	07/14/2021

Procedures Followed
FVE-014 rev. 2

Form Revision 6: 02/04/2012

Standards Used

Instrument	Serial Number	Trace Number	Next Cal
FVS-093	03111	CK191-31886-628	10/31/2020
FVS-275A	RY11838	CJ191-70508-513	07/28/2020

Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. (This is considered "shared responsibility.") Uncertainties expressed in nominal units.

All instruments have been calibrated against standards traceable to NIST. Calibration was completed in accordance with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 and ANSI/NCSL Z540.3-2006. Other standards listed upon request.

Calibration Results

* denotes "Out of Tolerance"

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
Clockwise	(in lb)	(in lb)	(in lb)	(in lb)	(in lb)	(in lb)
	30.00	29.10	30.90	29.89	29.89	0.091
	90.00	87.30	92.70	90.23	90.23	0.271
	150.00	145.50	154.50	152.00	152.00	0.450
Counter Clockwise	(in lb)	(in lb)	(in lb)	(in lb)	(in lb)	(in lb)
	30.00	29.10	30.90	30.31	30.31	0.091
	90.00	87.30	92.70	89.53	89.53	0.271
	150.00	145.50	154.50	148.58	148.58	0.450

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CERTIFICATE OF CALIBRATION

ilac-MRA ANAB ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY
Certificate No. ACT-1272

Certification Number CK198-49542-348

For Eaton Corporation - ICD
W126 N7250 Flint Drive
Menomonee Falls, WI 53051

Purchase Order #	4044-671109
Test Instrument	Tape Measure
Make	Stanley
Model	30-824
Serial Number	
Identification	EM6927
Customer Location	ICD Tony
Condition Received	In Tolerance
Condition Returned	In Tolerance
Calibrated By	Matthew Roughen
Technical Review By	Laura Fuhrmann
Calibration Location	FVM
Calibration Conditions	69.5°F, 20.8°C, 34.8%RH
Calibration Date	07/16/2020
Recalibration Due	07/16/2021

Procedures Followed
FVM-042 rev. 1

Form Revision 6: 02/04/2012

Standards Used

Instrument	Serial Number	Trace Number	Next Cal
FVM-044	C404R	CH121-20770-384	05/28/2022
FVM-079A	RY11924	CJ191-72229-513	07/28/2020

Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. (This is considered "shared responsibility.") Uncertainties expressed in nominal units.

All instruments have been calibrated against standards traceable to NIST. Calibration was completed in accordance with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 and ANSI/NCSL Z540.3-2006. Other standards listed upon request.

Calibration Results

* denotes "Out of Tolerance"

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
Length	(in)	(in)	(in)	(in)	(in)	
	12.000	11.969	12.031	11.995	11.995	0.0006
	24.000	23.938	24.062	23.995	23.995	0.0007
	48.000	47.938	48.062	47.995	47.995	0.0007
	72.000	71.938	72.062	71.995	71.995	0.0007
	144.000	143.938	144.062	143.995	143.995	0.0006
	216.000	215.938	216.062	215.995	215.995	0.0006
	312.000	311.938	312.062	311.995	311.995	0.0007
Length	(cm)	(cm)	(cm)	(cm)	(cm)	(cm)
	500.00	499.00	501.00	499.87	499.87	0.007
	1000.00	999.00	1001.00	999.87	999.87	0.006
	5000.00	4999.00	5001.00	4999.87	4999.87	0.008
	8000.00	7999.00	8001.00	7999.87	7999.87	0.012

Terminal and Conductor Temperature Testing of 14 AWG Copper-Clad Aluminum and 14 AWG Copper Conductors

Part II – Thermocycling Tests

For

Bimetallics Task Group

Conducted at

Eaton Laboratories
Menomonee Falls, Wisconsin

Report by

Chuck Mello
on behalf of Bimetallics Task Group

Report Date

November 13, 2020

Table of Contents

Appendices

1.0 Introduction and Purpose

At the direction of the NFPA Standards Council in their Decisions D#19-2 and D#19-23, a Bimetallics Task Group of balanced interest was appointed. The scope was to review the proposed changes to the 2020 edition of the *NEC*® that relate to copper-clad aluminum conductors and recommend changes through tentative interim amendment(s) and/or to provide public inputs for the next revision cycle.

As the task group conducted the work, it was determined that testing data had been provided substantiating the ampacity of 14 AWG copper-clad aluminum but a number of related questions about 14 AWG copper-clad aluminum applications arose regarding terminal temperatures when applied to circuit breakers, wire splicing devices and device terminals. A testing plan was developed, reviewed over several task group meetings, and accepted by the task group to address the terminal temperature questions. This testing was completed at the Eaton Corporation laboratory facilities in Menomonee Falls, Wisconsin. The helpful assistance of Mr. Tom Domitrovich, Mr. Kevin Arnold, Mr. James Parrett, and Mr. Steve Averbeck with Eaton Corporation is greatly appreciated in arranging for and executing the testing.

A Part I report for the static heating and flexing tests was issued on August 28, 2020 to the Bimetallics Task Group. The Part I report was also included as an attachment to applicable public inputs developed by the Bimetallics Task Group that were due to NFPA by September 7, 2020.

This Part II test report provides the testing arrangement, testing procedures and results for the thermocycling testing part of the testing program. The testing detailed in this report commenced August 28, 2020 and completed on October 16, 2020. The separation of the reports was necessary to meet the NFPA deadline of September 10, 2020 to submit public inputs.

The purpose of this testing was to provide data, as requested by the Bimetallics Task Group, to understand certain installation and operating conditions when considering the application of 14 AWG copper-clad aluminum conductors at the proposed ampacity for branch circuits. The testing that was completed also included 14 AWG copper conductors based on its *NEC*® ampacity for comparison and performance. The basis for comparison was at the 60ºC ampacity rating for copper (15 amps) and the proposed 60ºC ampacity rating for copper-clad aluminum (10 amps). The testing included in the Part I and Part II reports was designed to represent a typical installation to determine the following:

1) The temperature (temperature rise) on the terminals and conductor immediately adjacent to a 10 Amp and 15 Amp molded case circuit breaker, under normal and identified abnormal static heating (steady state) conditions
2) The temperature (temperature rise) on wire-splicing devices (e.g., Ideal Wire Nuts® or similar), and conductor immediately adjacent, commonly used for splicing in junction or device boxes or attaching leads from utilization equipment, under normal and abnormal conditions
3) The temperature (temperature rise) on wiring devices (single receptacle as representative) and conductor immediately adjacent under normal and abnormal static heating (steady state) conditions

4) The temperature (temperature differential) and the thermal stability (stability factor) on wire-splicing devices (e.g., Ideal Wire Nuts® or similar), and conductor immediately adjacent, commonly used for splicing in junction or device boxes or attaching leads from utilization equipment, at 2⅔ times rated conductor ampacity under thermal cycling conditions
5) The temperature (temperature rise) and the thermal stability (stability factor) on wiring devices (single receptacle as representative) and conductor immediately adjacent, at 2⅔ times rated conductor ampacity under thermal cycling conditions
6) Conductor retention on wiring devices after abnormal thermal-cycling
7) The flexing durability of 14 AWG copper-clad aluminum when installed and removed from a single-gang device box

Since the various product standards do not presently have requirements, procedures or parameters for 14 AWG copper-clad aluminum, the testing being conducted was based on the proposed 10-ampere branch circuit rating at 60°C and percentage multipliers taken from the applicable standards. Where the standard does not provide a percentage value, then the current for the testing was interpolated from the values for relative copper and/or aluminum conductors from the standard. The values for testing of 14 AWG copper were taken from the applicable product safety standards with an ampacity basis of 15 Amps at 60°C

It is to be understood this more extreme testing is being conducted solely to provide specific performance data and information as requested by the task group. The testing does not provide performance evaluation methodology or data normally conducted for certification of any of the components used for this testing.

It should be noted that the thermal cycling and pull testing conducted here was derived from performance evaluations solely applicable to self-contained device terminations and are never performed to list end-products having terminations suitable solely for either copper conductors or for copper-clad aluminum conductors used in devices that are not self-contained. The intent of the Task Group was to evaluate added attributes and more severe parameters differences not normally conducted that might reveal any underlying performance deficiencies, thereby alleviating by absence or confirming by presence any concerns regarding essential safety margins.

If 14 AWG copper-clad aluminum is accepted into the 2023 *NEC*®, then numerous UL standards will need to be revised for the 10-ampere ampacity and further evaluation testing may need to be completed under the incremental requirements established in those standards. The end-product standards' evaluation programs are predicated upon compliance with the *National Electrical Code*®, including permitted conductor sizes and associated ampacities, as published. The testing for certification therefore could differ from what was provided here. The goal again was to provide information for a typical installation specific to terminal temperatures. The changes to UL standards will not begin to occur until 14 AWG copper-clad aluminum has been recognized for installation in the *NEC*®.

To provide a basis to consider the test results for 14 AWG copper-clad aluminum, duplicate test set ups were constructed using 14 AWG copper conductors. These end-products have established terminal capacity based upon a given conductor size. The “apples-to-apples” comparison was conducted at the given 14 AWG size but at the ampacity associated with each conductor material at that 14 AWG size. The only difference in the thermocycling setup for 14 AWG copper therefore is the 15-Ampere basis for the testing. This additional testing data provides a direct comparison in the same environment and same test arrangement at the 60ºC ampacity values for each of these two conductor types and assemblies.

2.0 Testing Arrangement and Setup

The testing was conducted in a suitable facility with environmental controls and documented monitoring. The facility was free from extraneous changes in ambient temperature and from having random air flow (drafts) through the testing area. Based on input from the task group, the supply air ducts in the area were either turned off or air flow diverted from the testing area, see photo 1 in Appendix F. Ambient temperature was maintained between 20ºC and 25°C and recorded with thermocouples positioned in the testing area while temperature testing was completed.

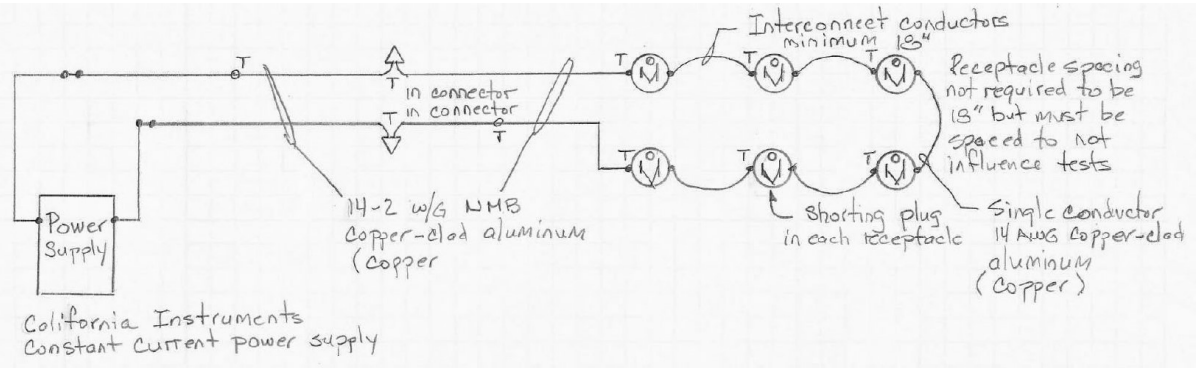


Figure 1 – Typical Test Circuit Diagram

The Eaton facility, being a division within a manufacturing company of wiring devices and circuit breakers, has laboratory technicians that are very familiar with testing of circuit components and equipment to various applicable UL standards.

The test circuit diagram shown in Figure 1 above provides the basic layout of one (1) testing circuit consisting of the conductor (14 AWG copper-clad aluminum or copper NM-B cable) two (2) wire-splicing devices, and six (6) single receptacles. For the thermocycling testing, the circuit breakers used for the previous test circuit setups were removed and the 14 AWG conductors connected directly to the power supply bus. To complete the thermocycling testing the two test circuits for copper-clad aluminum were connected in series on one test board and connected to one power supply. The two 14 AWG copper circuits were connected in series on a separate test board and connected to one power supply. Photos 1 through 8 in Appendix F show the general test setup for completing the thermocycling testing. The thermocycling testing of all four test circuits was run simultaneously.

Each of the four (4) circuits have, the wire splicing devices on the black and white wire as described below, and three (3) each of receptacles from two of the manufacturers.

For example, one circuit setup had:

- 14 AWG copper-clad aluminum NM-B conductors
- Mfg. 4 and mfg.5 wire splicing devices respectively, on the black and white conductors
- Three each of the mfg. 8 and mfg. 9 receptacles, and
- 14 AWG THHN copper-clad aluminum conductors for interconnection of the receptacles

These components were connected together to form a complete circuit. The second setup for 14 AWG copper-clad aluminum has the same assembly but with mfg.6 and mfg.7 wire spicing devices and with mfg. 10 and mfg.11 receptacles. The third and fourth setups were the same as 1 and 2 except using 14 AWG copper conductors.

Due to testing of the respective conductors with wire-splicing devices and receptacles together, the test arrangement was different than what may be used for certification testing of a single type of device. The test purpose was to approximate an actual installation under laboratory type conditions and not to establish certification type testing for any one device.

For the thermocycling test, the two power supplies used were programmable constant current power supply sources. Each power supply was connected to one of the combined series circuits and provided the current level specified for the tests being conducted.

For each of the four circuits the following description is provided, see circuit diagram in figure 1 and photos 1 through 8 in Appendix F:

1) The four (4) circuits were mounted on an insulating sheet approximately 4 feet high and 8 feet wide. The partition had suitable framing to provide structural support for the partition to be in a vertical orientation to the floor. One board was for copper-clad aluminum and the other board was for copper conductors.

2) During all testing, suitable barrier tape, safety cones, barriers, or other means was in place in accordance with the laboratory safety procedures to keep unauthorized persons out of the area and away from exposed live parts.

3) The individual conductors and devices were arranged horizontally with approximately 12 inches of vertical spacing between each horizontal assembly. Staples, or other fastening devices, such as cable ties, were used to keep the NM-B cable aligned with the respective test assembly.

4) From the power supply connection terminal approximately 4 feet of 14-2 NM-B cable was installed and supported as provided above. From this center junction another 2 feet of 14-2 NM-B cable (copper-clad aluminum or copper as applicable) was installed. The junction in the middle had approximately 6 inches of exposed conductor and a splice completed with yellow wire-splicing devices as provided for the black, white conductors. The following was applied to the two setups for the copper-clad aluminum conductors respectfully and repeated for the copper conductor setups.

    a) The black wire for the first circuit set of three used a mfg. 4 yellow wire-splicing devices

    b) The white wire for the first circuit set of three used an mfg. 5 yellow Wire Nuts®

    c) The black wire of the second circuit set of three used a mfg. 6 yellow wire-splicing devices

    d) The white wire of the second circuit set of three used a mfg. 7 yellow wire-splicing devices

    The manufacturer and location of the wire-splicing devices used was recorded for each test circuit.

5) Six (6) receptacles were installed at the end of each horizontal assembly.

   a) The first set of circuits of copper-clad aluminum or of copper had three (3) mfg. 11 receptacles and then three (3) receptacles from mfg. 8 all connected in series.

   b) The second circuit of copper-clad aluminum or of copper had three (3) receptacles from mfg. 10 and then three (3) receptacles from mfg. 9 all connected in series.

   The receptacles were spaced a minimum of six (6) inches apart horizontally and/or vertically and were interconnected with a minimum of eighteen (18) inches of 14 AWG solid THHN copper-clad aluminum or copper conductors respectfully.

   The receptacles were mounted to the wall surface with screws, so that the face of the receptacle was approximately 1½ inches from the insulating board partition surface.

   For each manufacturer the receptacles were connected to terminals as follows:

   a) One receptacle had the conductors installed at each wire binding screw and the conductors were wrapped counterclockwise around the screw shank under the screw head, for ⅔ to ¾ of wire binding screw circumference. See photo 6 in Appendix F for typical installation.

   b) The second receptacle had the conductors installed into one side back terminal (entry hole) of the pressure plate terminal. See photo 7 in Appendix F for typical installation.

   c) The third receptacle had two conductors installed into each back-side pressure plate terminal as follows: one conductor of the test circuit into each side (hot and neutral) of the pressure plate terminal and one additional short conductor of equal diameter and material into the other side (entry hole) of the same pressure plate terminal. The second conductor was to fill the slot only and is not required for any other purpose than to balance the mechanical clamping forces applied. See photo 8 in Appendix F for typical installation.

   Each receptacle had a shorting plug installed as follows:

   a) The ungrounded (BLACK) and grounded (WHITE) contacts of each receptacle being tested were connected together by a mated attachment plug having rigidly-attached solid blades.

   b) The terminals of each attachment plug were short-circuited by the shortest feasible length of 14 AWG stranded copper conductor from type SJ flexible cord.

   c) The flexible cord shorting conductor was mechanically terminated into the pressure plate terminals and the connection torqued to the manufacturer's specification.

6) The conductor from the neutral terminal of the last receptacle in the series was routed back using the white wire in the NM-B cable, through the wire-splicing devices and terminated at a terminal bar mounted to the support board for connection back to the power supply.

7) All connections were tightened as follows. Torquing tools were calibrated and calibration documented:

   a) The wire-splicing devices were torqued to the manufacturer's specification in the instructions. If there was no specification, then the 14 AWG copper-clad aluminum conductors were torqued to 2.47 lbf-in and the 14 AWG copper conductors were torqued to 4.11 lbf-in [Specification from UL 486C – 9.1.9.4]

   b The terminals of the receptacles and of the attachment plugs were torqued to the manufacturer's specification in the installation instructions. If there was no torque specification provided, then the terminals were torqued to 9 lbf-in.

8) Thermocouples were connected as shown in the diagram, Figure 1 and as shown in photos 2 through 8 in Appendix F.

   a) Thermocouples were installed on device terminals so that it did not interfere with the terminal.

      For the wire-splicing devices, the thermocouples were attached into the wire bundle within the wire-splicing devices.

   b) The thermocouples that measured center wire temperatures had a flap of the NM-B jacket and the conductor insulation peeled back to expose the conductor. The thermocouple was attached with thermo-cement to the conductor and the conductor insulation and jacket flap folded back to the original position with two wraps of black electrical tape wrapped to hold the flap in place.

   c) A thermocouple was positioned midway in elevation to the test setup for each circuit and recorded the ambient temperature as testing was completed.

10) The power supply was a programable constant current power supply. The current was monitored and recorded by the data logger along with the temperature recordings. The power supply was connected to a terminal bus on the board, and to the neutral terminal bar where the return white conductor from the NM-B cable was terminated.

3.0 Materials for Testing

The generous support with the supplying of materials for the thermocycling testing by Copperweld, Eaton, Hubbell, Legrand, and Leviton, are acknowledged and appreciated. The following materials were used to complete the setups for thermocycling testing as described above.

1) The yellow wire-splicing devices were as follows:
    a) Gardner-Bender ULTRA WingGard™
    b) Ideal WingTwist®
    c) 3M™ Performance Plus™ Red/Yellow+
    d) Commercial Electric WT4
2) The receptacles for both the copper-clad aluminum and copper testing were:
    a) Eaton (Cooper) model TR6250W, NEMA 5-15R single receptacle with wire binding screw and pressure plate terminals (back and side wired)
    b) Hubbell model HBL 5261, NEMA 5-15R single receptacle with both wire binding screw and pressure plate terminals (back and side wired)
    c) Legrand (Pass & Seymour) model TR 5251, NEMA 5-15R single receptacle with both wire binding screw and pressure plate terminals (back and side wired)
    d) Leviton model T 5015, NEMA 5-15R single receptacle with both wire binding screw and pressure plate terminals (back and side wired)
3) Thermocouples, UL calibrated, model UL 3055, with sufficient length to connect and route to datalogger recording device.
4) Datalogger recording device and laptop or another required device for the datalogger.
5) Programable power supplies from Eaton laboratory. Maximum current for the copper was 30 Amps and for the copper-clad aluminum was 20 amps.
6) Approximately 50 feet each of 14-2 w/ground copper-clad aluminum NM-B cable and of 14-2 w/ground copper NM-B cable.
7) Approximately 50 feet each of 14 AWG solid THHN copper-clad aluminum and 14 AWG solid THHN copper single conductors.

4.0 Test Procedures

4.1 Conductor Material Testing

A sample of each the 14-2 NM-B and 14 AWG THHN copper-clad aluminum conductors used for the testing was returned to the Copperweld factory laboratory for analysis. The testing was performed to confirm the conductors that were used for the testing at Eaton were in fact 14 AWG and met the requirements for copper-clad aluminum as specified in UL 83 Annex E and ASTM B566. The packaging was photo documented from the Eaton laboratory and the opening of the package at the Copperweld laboratory photo documented.

The Copperweld laboratory technician, who routinely performs the full ASTM B566 and UL follow-up battery of testing, completed all the testing and documented it on a Copperweld laboratory test data sheet.

Standard materials testing was completed by Copperweld laboratory technician including:

- DC resistance
- Copper thickness
- Copper Volume
- Tensile strength
- Elongation
- Adhesion
- Cohesion

The following tests, as completed by the Copperweld laboratory technician, were witnessed and documented by the UL Field Representative that normally completes follow-up inspections of copper-clad aluminum conductors as part of the recognized component program, under UL category DVVU2 and UL standard *UL 3566*:

- DC resistance
- Copper thickness
- Tensile strength
- Elongation

4.2 Terminal Temperature Testing

The following test procedures, except the flexing test, used references from parts of UL 486A-486B; UL 486C; UL 489; UL 20; and UL 498.

The test results were recorded with twelve (12) thermocouples for each of the four (4) test circuits as shown in the figure 1 drawing above. The first circuit using copper conductors had the thermocouple locations identified as follows:

1a – Receptacle (manufacturer 1 ID) terminated with wire binding screw

2a – Receptacle (manufacturer 1 ID) with a single conductor terminated into one of the side back terminal (entry hole) of the pressure plate terminal

3a Receptacle (manufacturer 1 ID) with two conductors terminated into each side back terminal (entry hole) of the pressure plate terminal

4a – Receptacle (manufacturer 2 ID) terminated with wire binding screw

5a – Receptacle (manufacturer 2 ID) with a single conductor terminated into one of the side back terminal (entry hole) of the pressure plate terminal

6a Receptacle (manufacturer 2 ID) with two conductors terminated into each side back terminal (entry hole) of the pressure plate terminal

7a not used (was circuit breaker thermocouple in static heating testing)

8a Line conductor

9a Line side (black conductor) wire splicing device

10a Load conductor

11a Load side (white conductor) wire splicing device

12a Room ambient temperature

13a Current in circuit

The second setup with copper conductors, with using manufacturer 3 and 4 receptacles, used the same point identifications but has the point identification use a “b” in place of the “a”.

The third and fourth setups were assembled with copper-clad aluminum conductors duplicating the devices and assembly used for the copper conductors. The point identification for the copper-clad aluminum conductors used the letters “c” and “d” in place of “a” for the points as identified above.

Test #1 – Rated Current Temperature

The terminal temperature testing was completed in August 2020 and the results (Appendix C1) are provided in the Part I report of this project. Please see the Part I report for complete details of test procedure and results.

Test #2 – Circuit Breaker Overload Temperature

The terminal temperature testing was completed in August 2020 and the results provided in the Part I report of this project. Please see the Part I report for complete details of test procedure and results.

Test #3 – Wiring Device Overload Temperature

The terminal temperature testing was completed in August 2020 and the results (Appendices C2 to C4) are provided in the Part I report of this project. Please see the Part I report for complete details of test procedure and results.

Test #4 – Circuit Breaker Overload Temperature

The terminal temperature testing was completed in August 2020 and the results (Appendices C2 to C4) are provided in the Part I report of this project. Please see the Part I report for complete details of test procedure and results.

Test #5 – Wiring Device Thermal Cycling

Testing of all four circuits without a circuit breaker in the circuit was completed simultaneously. Two circuits were for 14 AWG copper conductors and two circuits were for 14 AWG copper-clad aluminum conductors. For each of conductor material assemblies, the top row black supply conductor was connected to a terminal directly connected to the programmable power supply. The return white conductor from the top row was connected to the black supply conductor in the second row for a series circuit. The return white conductor from the second row was connected to the neutral terminal block.

Each circuit was operated at the indicated currents for 500 cycles of 1½ hours on and then 1/2 hour off. The current on and off cycle was controlled using the programmable power supply. The test currents are as follows:

a) Copper tested at 40 Amps (266 percent of the 15-amp ampacity at 60°C)

b) Copper-clad aluminum tested at 26.67 Amps (266 percent of the proposed 10-amp ampacity at 60°C

Device terminal temperatures, ambient temperature, and current were recorded by the datalogger every 30 minutes starting at time zero.

The testing data results at eleven (11) cycle intervals. These were recorded at the cycle intervals of 25, 50, 75, 100, 125, 170, 215, 260, 340, 420, 500 cycles in accordance with UL 498 section 169.2.4 and UL 486C section 7.2.3. The temperature results recorded at these cycle intervals was used to calculate the thermal stability in accordance with UL 498 section 169.4.1 and UL 486C section 7.2.4. The difference in the recorded ambient temperature and the average ambient temperature for the individual test setup was calculated to show ambient temperature stability.

For the receptacle terminal temperature recorded data, the temperature rise above the recorded ambient for each interval was calculated and documented on the data sheets. The average temperature rise was then calculated for the eleven recorded cycles. The temperature stability factor was calculated by subtracting the calculated temperature rise for each data entry from the average for that device. The deviation of any calculated temperature rise from the average is not to exceed 10°C.

For the thermal cycling test, the terminal temperature rise above ambient should not exceed:

a. wire-splicing devices – 125ºC [UL 486C, 7.2.2]

b. receptacle terminal (at rated current) – 100ºC [UL 498, 169.1.1(b)]

For the wire splicing device terminal temperature recorded data, the temperature difference the reference conductor temperature for each interval was calculated and documented on the data sheets. This is different than the procedure for the wiring devices. The reference conductor temperature used was the line conductor recorded temperature. The average temperature differential was then

calculated for the eleven recorded cycles. The temperature stability factor was calculated by subtracting the calculated temperature differential for each data entry from the average for that device. The deviation of any calculated temperature rise from the average is not to exceed 10°C

At the conclusion of the thermal cycling each receptacle was removed and a pull-out test with 20 lbs. force applied to the conductors connected to the line and the neutral terminals. The pull test was completed with the pulling direction perpendicular to the plane of the back of the receptacle for one (1) minute. The test for each side of the receptacle was done separately.

Test # 6 – Conductor Flexing Test

The conductor flexing tests were completed in August 2020 and the results (Appendix D) are provided in the Part I report of this project. Please see the Part I report for complete details of test procedure and results.

5.0 Test Results

5.1 Copper-Clad Aluminum Conductor Material Testing

After the static heating testing was completed, Eaton laboratory technicians packed and shipped samples of the copper-clad aluminum conductor, NM-B cable and THHN single conductor, that had been used for the testing to Copperweld's laboratory for verification testing. Photos 11 to 13 in Appendix F show the samples the Eaton laboratory technicians packaged into the bag and shipped to the Copperweld laboratory. Note the date on these photos as August 24, 2020. Appendix G pages G1 and G2 show photos of the received package and opening of that package with these samples for the testing.

The samples of the 14 AWG copper-clad aluminum NM-B cable and the 14 AWG copper-clad aluminum THHN single conductors were tested in the Copperweld factory laboratory on August 27, 2020. The Copperweld laboratory testing data is provided in Appendix G page G3 and the calibration of the test equipment on pages G4 through G6.

The UL field engineer who routinely completes the quarterly follow-up inspections for the copper-clad aluminum conductor witnessed the testing required under the UL standard UL 3566 follow-up program; that testing was completed on August 27, 2020. As shown in Appendix G, page G1 and Appendix G, page G7, the UL field engineer confirmed that "*the 14 Awg from the NMB and THHN samples passed the UL tests for DVVUs, including Tensile, Elongation, copper thickness and DC resistance"*

The test results for the copper-clad aluminum confirm that the conductors used for this testing were 14 AWG and that the material tested met the requirements in ASTM B566.

5.2 Static Heating Tests 1 Through 4

The static heating testing was completed in August 2020 and the results (Appendix C1 to C4) are provided in the Part I report of this project. Please see the Part I report for complete details of test procedure and results.

5.3 Flexing Test 6

The conductor flexing tests were completed in August 2020 and the results (Appendix D) are provided in the Part I report of this project. Please see the Part I report for complete details of test procedure and results.

5.4 Test Setup and Torquing

The test setups were as described in Section 2.0 of this report and shown in photos 1 through 8 in Appendix F. The terminations were tightened to the applicable torque value with a calibrated torque wrench. For the thermocycling testing table 1 below shows the torque values applied for each setup and device terminal.

Table 1

Item being torqued	in/lbs.	mfr. spec	default
3M wire splicing device (on CU clad AL wire)	2.47	no	yes
Commercial Electric wire splicing device (on CU clad AL wire)	2.47	no	yes
Gardner-Bender wire splicing device (on CU clad AL wire)	2.47	no	yes
Ideal wire splicing device (on CU clad AL wire)	2.47	no	yes
3M wire splicing device (on copper wire)	4.11	no	yes
Commercial Electric wire splicing device (on copper wire)	4.11	no	yes
Gardner-Bender wire splicing device (on copper wire)	4.11	no	yes
Ideal wire splicing device (on copper wire)	4.11	no	yes
Legrand receptacle	9	no	yes
Leviton receptacle	9	no	yes
Cooper receptacle	9	no	yes
Hubbell receptacle	12	yes	no

5.5 Thermocycling Test 5 Results.

5.5.1 Data Sheet Layout

The recorded data for the 11 specified intervals, the calculated temperature differential, and the calculated temperature stability factors are found in Appendix H. For each of the test setups, there are three (3) sequential pages (e. g. Appendix H pages H1, H2, H3). For each set of pages, the first page is the recorded data (salmon color header). On this page, the last row shows the difference from the recorded ambient temperature for that interval from the average ambient temperature shown in the last column. The second page (violet color header) is the calculated temperature rise, or temperature differential. The third page (green color header) is the calculated stability factor.

On the second and third page of each set, the rows for line and load conductor temperatures do not have any calculated temperature rise or differential values since temperature rise or differential does not apply to conductor temperatures. Similarly, there is no calculated values for ambient temperature rise or current as these are strictly recorded values and no calculations are applicable.

5.5.2 Missing Data Points

The continuous duration for this test is 500 cycles, at 2-hours each, which is 1000 hours (approximately 42 days) of laboratory time. A review of the data sheets in Appendix H note that two columns have recorded “no data” for the 100 and 125 cycle columns. During the 3-day Labor Day weekend, a computer system failure for the data logger stopped recording the data. The separate system operating the power supply that cycled power on and off as programed did continue to operate. Due to the datalogger recording being off, the 100-cycle interval and 125-cycle intervals did not have data to enter onto the data sheet. This situation was caught at the 130-cycle point Tuesday morning. It was decided to use the 130-cycle data for the 125-cycle interval. To make up the one missed interval of 25 cycles, an additional 25 cycles were added to the end point making the overall testing 525 cycles. The final data recording provided the 11 entry points needed for calculations.

5.5.3 Specific Device Data Comparison

Since the method of termination on each the three receptacles from one manufacturer was different (wire binding screw, back wired with pressure plate with one conductor and back wired with pressure plate with two conductors) exact data comparison of terminal temperature needs to be done line by line. For example, from appendix pages H1 through H3, the line 1a for manufacturer no. 10 with copper needs to be compared with line 1c on Appendix pages H7 through H9 for manufacturer no. 10 with copper-clad aluminum.

Similarly, for the wire splicing device setups the four (4) devices were from the four (4) different manufacturers. Therefore, the line 9a for copper would be the same wire splicing device as line 9c for copper-clad aluminum.

5.5.4 Temperature Rise

One of the limits for this testing was in a maximum allowed temperature rise above ambient throughout the testing. A review of the calculated temperature rise values found that none of the calculated results exceeded the maximum allowed 125°C for wire splicing devices or 100°C for the receptacles. The maximum temperature rise for the receptacles was 87.48°C for copper and 64.85°C for copper-clad aluminum. The maximum temperature rise above ambient for the wire splicing devices was 102.62°C for copper and 69.4°C for copper-clad aluminum.

5.5.5 Conductor Temperatures

A review of the conductor temperatures subjected to this elevated current for 500 cycles, found the 14 AWG copper-clad aluminum conductor temperatures to operate on average lower than the copper conductors. Table 2 below extracts the average line and load conductor temperatures to show the comparison.

Table 2

Conductor Material	Line Wire (°C)	Load Wire (°C)
Copper (circuit no. 1)	114.86	106.77
Copper (circuit no. 2)	96.57	93.00
Copper-clad aluminum (circuit no. 1)	95.10	77.19
Copper-clad aluminum (circuit no. 2)	82.41	77.36

5.5.6 Receptacle Terminal Temperatures and Stability Factor

A line by line or general review of the recorded temperature rise on the receptacle terminals found the terminals with copper-clad aluminum to have a temperature rise above ambient less than the related copper connected terminals. A line by line or general review of the calculated temperature rise values also found the temperature rise values to be stable for each device. Table 3 below is the average calculated temperature rise for the receptacles.

Table 3

Data sheet Device ID No.	Copper Circuit 1	Copper Circuit 2	Copper-clad aluminum Circuit 1	Copper-clad aluminum Circuit 2
	(a)	(b)	(c)	(d)
1	79.33	63.76	47.00	38.18
2	85.74	62.53	47.72	41.22
3	65.67	52.56	43.00	34.12
4	77.34	66.43	41.26	39.88
5	81.27	71.32	46.86	40.09
6	70.57	65.07	43.02	39.37

The stability factor is calculated separately for each receptacle terminal based on the formula in UL 498 section 169.4.1. The procedure to complete this calculation is to determine the temperature rise from ambient for each of the eleven (11) recorded data points. The average of these eleven (11) calculated temperature rise values is determined. These results are shown in Appendix H, pages H2, H5, H8 and H11.

The stability factor is then calculated by taking the calculated temperature rise and subtracting the average for that row. A positive result means the temperature rise value was higher than the average and a negative result means the temperature rise value is less than the average. The evaluation of the calculated stability factors found in all cases that the stability factor was less than the allow 10°C. These results are found in Appendix H pages H3, H6, H9 and H12.

5.5.7 Wire Splicing Device Temperatures and Stability Factor

A line by line or general review of the recorded temperatures on the wire splicing devices found the terminals with copper-clad aluminum to operate at a temperature below the related copper connected terminals.

The stability factor is calculated separately for each receptacle terminal based on the formula in UL 486C section 7.2.4. The procedure to complete this calculation is to determine the temperature difference between the reference conductor (line wire) and the recorded temperature of the wire splicing device. This is accomplished by subtracting the recorded wire splicing device temperature from the recorded line wire temperature for the eleven (11) recorded data points. The average of these eleven (11) calculated temperature difference values is determined. These results are shown in Appendix H, pages H2, H5, H8 and H11 on rows 9 and 11.

The stability factor is then calculated by taking the calculated temperature difference and subtracting the average for that row. A positive result means the temperature difference value was higher than the average and a negative result means the temperature difference value is less than the average. The evaluation of the calculated stability factors found in all cases that the stability factor was less than the allow 10°C. These results are found in Appendix H pages H3, H6, H9 and H12 on rows 9 and 11.

5.5.8 Receptacle Pull Out Test

After completing the 525 cycles and the receptacles at ambient temperature, the conductors connected to the line and neutral sides were cut so that as much length as possible remained for the pullout test. A calibrated weight of 20 pounds was attached to the conductor and gently lowered until the receptacle terminal was supporting the weight for a period of one (1) minute, see photos 9 and 10 in Appendix F. As shown in Appendix J all terminals passed the test and no conductors separated from the terminal.

6.0 Conclusions

The results from the thermocycling testing conducted for this part of the project found the 14 AWG copper-clad aluminum to have terminal and conductor temperatures generally less than copper when tested on the basis of the respective 60°C ampacity values. In all cases, the temperature recorded, the calculated temperature rise (differential), and the calculated stability factor were within the limits provided in the referenced UL standards. The pull testing found that after 525 cycles of current, the terminations did not loosen such that a 20-pound pulling force could pull the conductor out of or off the terminal.

As stated in the introduction, this testing project was to answer specific questions raised by the Bimetallics Task Group regarding temperature performance of 14 AWG copper-clad aluminum compared with 14 AWG copper in typical applications. These questions have been addressed and data provided with both the Part I and Part II reports submitted to the task group.

While testing conducted followed parts of several UL standards, it is to be understood the more extreme testing was conducted solely to provide specific performance data and information as requested by the task group. The testing does not provide performance evaluation methodology or data normally conducted for certification of any of the components used for this testing.

7.0 Test Equipment and Calibration

The following test and measurement equipment was used for the testing. The certificates of calibration for each of the above items is provided in Appendix K.

Description	manufacturer	Eaton Asset #	Cal Date	Cal Due
Thermocouples	Pacific Test and Measurement	N/A	7/10/2020	N/A
DACQ datalogger	Agilent (HP)	EM7054	7/16/2020	7/16/2021
DVM	Fluke	EM4437	7/16/2020	7/16/2021
DVM	Fluke	EM7014	7/16/2020	7/16/2021
DVM	Fluke	EM7024	7/16/2020	7/16/2021
CT	AEMC	EM6996	7/16/2020	7/16/2021
CT	AEMC	EM6997	7/16/2020	7/16/2021
CT	AEMC	EM8032	7/16/2020	7/16/2021
Torque wrench	CDI	EM8363	7/14/2020	7/14/2021
Tape measure	Stanley	EM6927	7/16/2020	7/16/2021
10 Pound weight	Standard Weight	EM3031-8	10/09/2020	10/09/2021
5 Pound weight	Standard Weight	EM3932-7	10/09/2020	10/09/2021
2 Pound weight	Standard Weight	EM6402	10/09/2020	10/09/2021
2 Pound weight	Standard Weight	EM3931-2	10/09/2020	10/09/2021
1 Pound weight	Standard Weight	EM3930-4	10/09/2020	10/09/2021
Stop watch	Sportline	EM8101	10/07/2020	10/07/2021

Appendix F - Photos

Photo 1 – Laboratory View

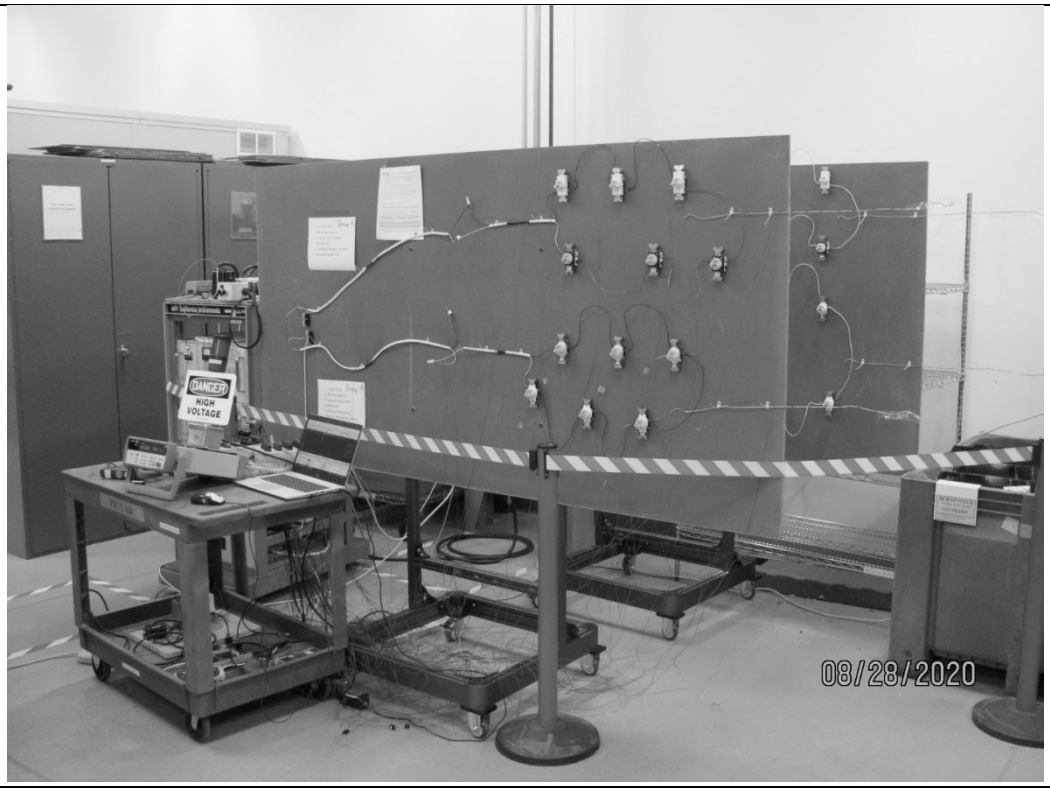


Photo 2 – Thermocycling Overall Test Arrangement

Appendix F - Photos

Photo 3 – Power Supply and Datalogger Arrangement

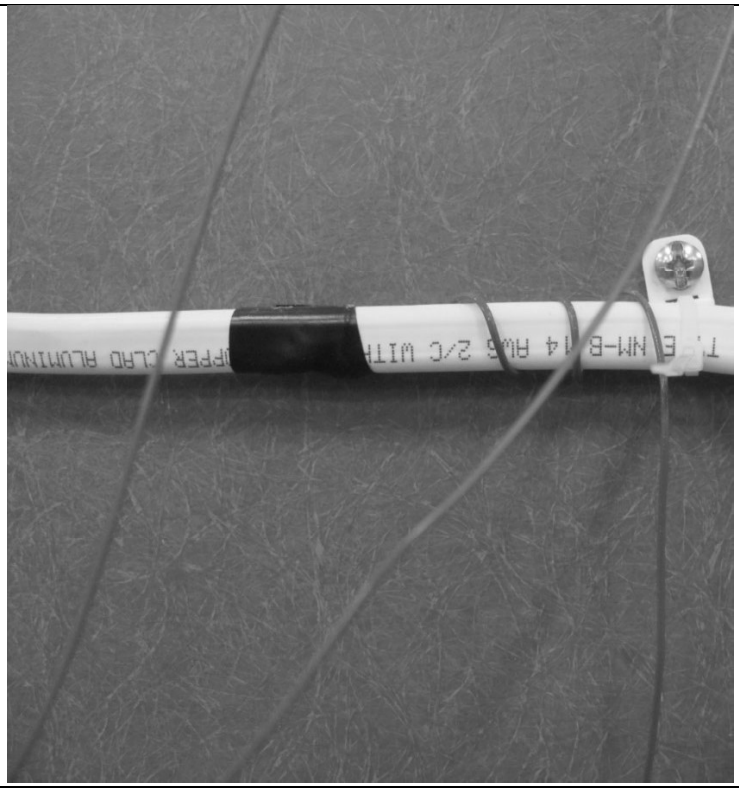


Photo 4– Copper-Clad Aluminum NM-B Cable with Thermocouple on Black Conductor

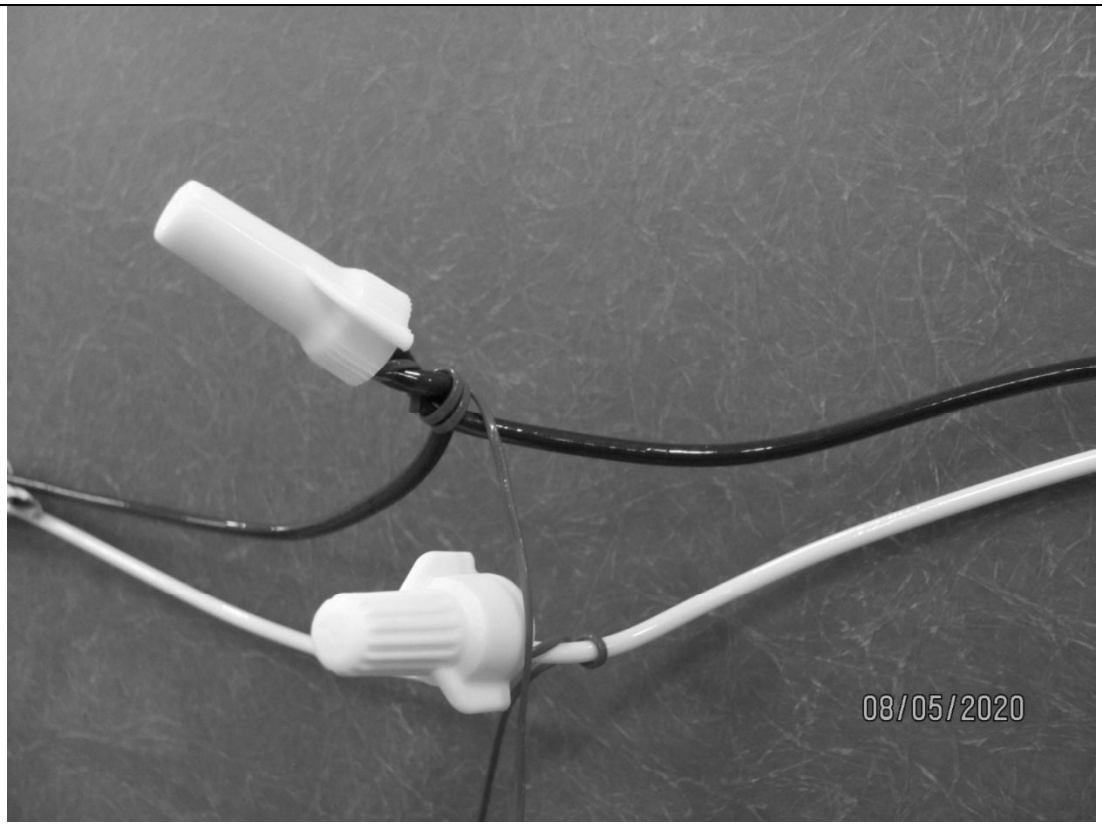


Photo 5 – Typical Installation of Wire Splicing Devices with Thermocouple

Photo 6 – Typical Installation of Receptacle using Wire Binding Screw

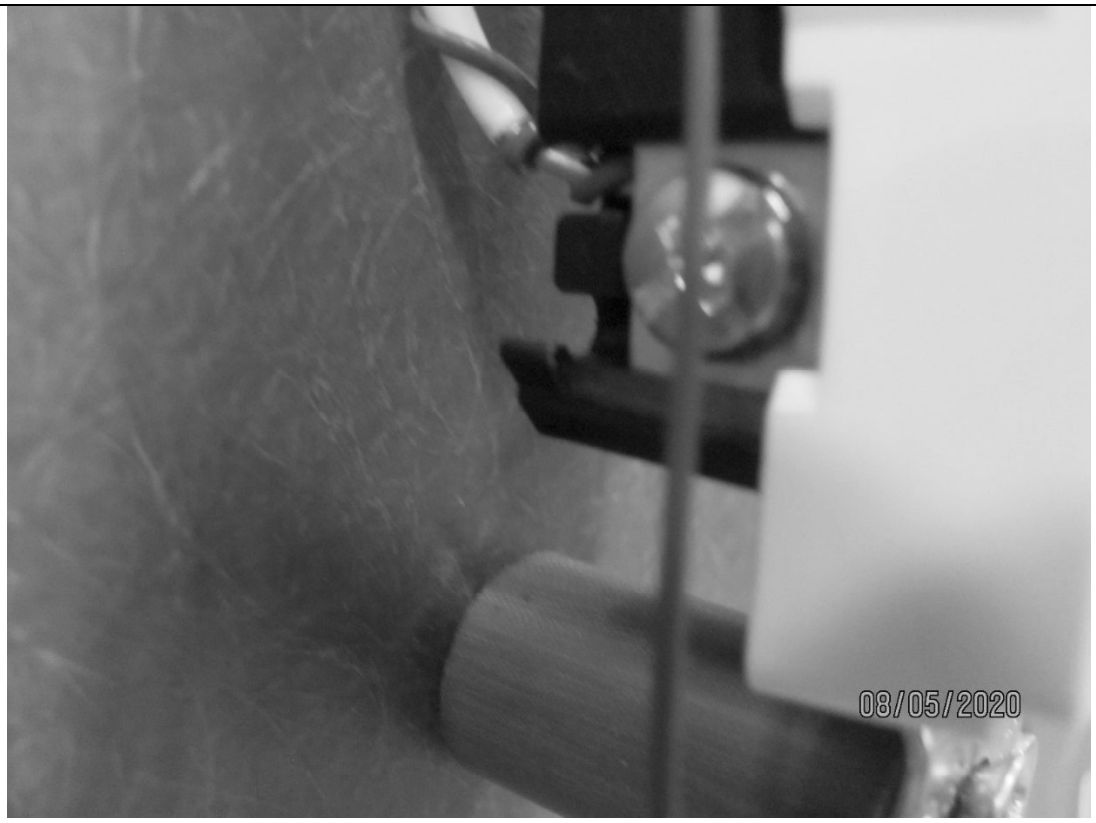


Photo 7 – Typical Installation of Receptacle Since Conductor Back Wired

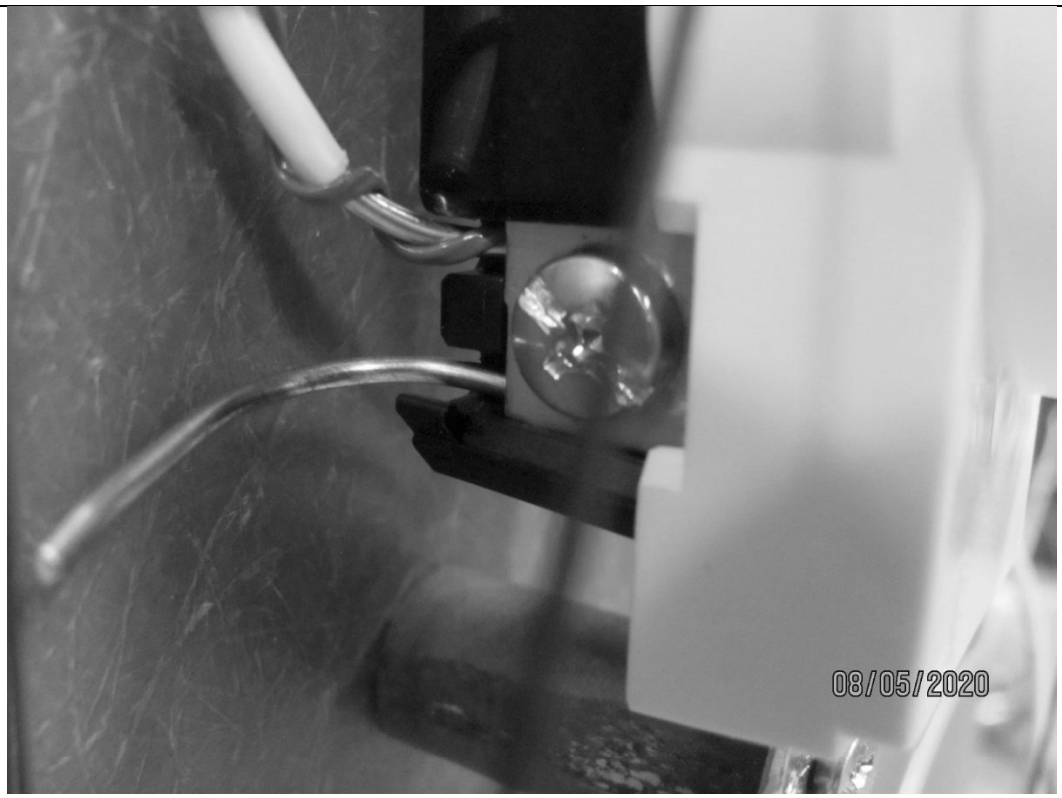


Photo 8 – Typical Installation of Receptacle Two Conductors Back Wired

Photo 9 – Pull Out Test Setup

Photo 10 – Pull Out Test Suspended Weight

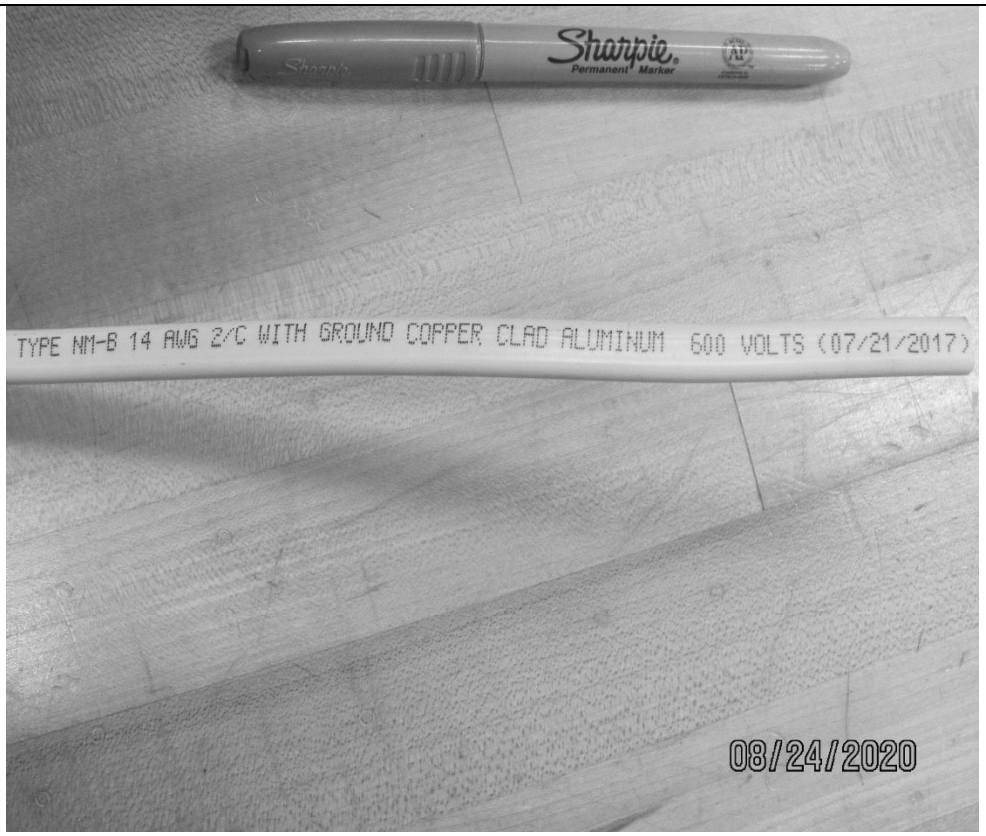


Photo 11 – Copper-Clad Aluminum NM-B Sample Packaging at Eaton

Photo 12 – Copper-Clad Aluminum THHN Sample Packaging at Eaton

Photo 13 – Copper-Clad Aluminum Sample Packaging at Eaton

COPPERWELD | Wired to Protect

The power of two

Metallurgical Laboratory Report

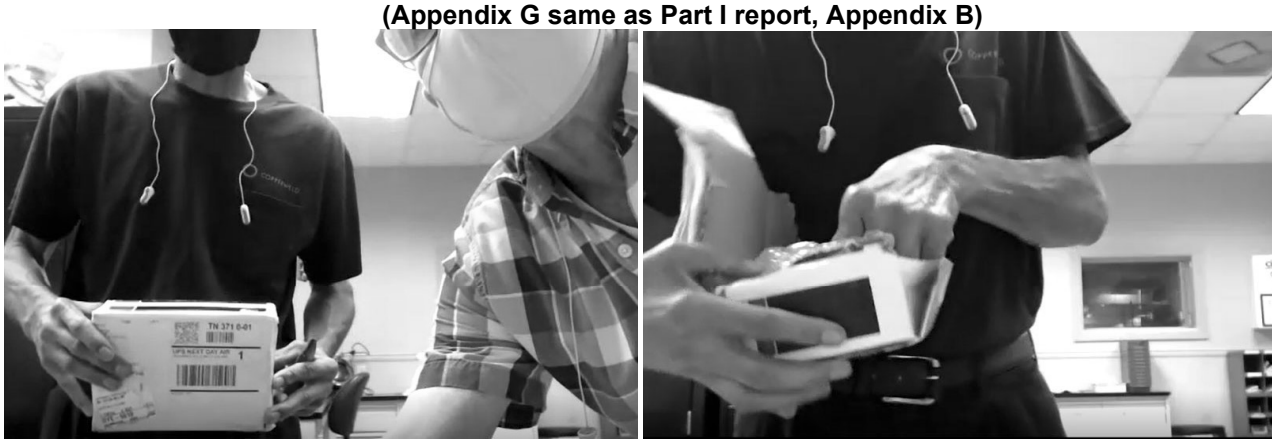
Customer:	**NEC Bimetallics Task Group**		
Subject:	**14 AWG Building Wire—NMB and THHN**		
Date:	**8-27-2020**	**Report No:**	**456**

Analysis By:	**Sammy Hampton --Metallographer**
Authored By:	**Sammy Hampton –Metallographer**
Approved By:	**Bill Lewey– QA Manager**

Tested to ASTM Designation: B 566-- 04a

The NM and THHN class samples in this report were sent to Copperweld via a sealed package by Eaton Menomonee Falls test lab. The chain of custody was not broken. The testing was witnessed by a third party as part of routine auditing service. The witnessing session was recorded. The copper clad aluminum conductor material from these samples that was tested on August 27, 2020 by the Copperweld Metallurgical Lab was manufactured by Copperweld Bimetallics to ASTM B566 standards.

Package as received from Eaton



Opening the Package

Package Contents

Appendix G - Copper-Clad Aluminum Lab Report
(Appendix G same as Part I report, Appendix B)

The wire consists of a core of aluminum with a continuous outer cladding of copper metallurgically bonded to the core throughout and meets the requirements of this specification (5.1).

Test required	Test result	ASTM B 566 requirement	Result
Diameter	**0.0641”**	**± 0.0001 0.0640” minimum 0.0642” maximum**	**Pass**
Break load (lbs.)	55 pounds	64.4 pounds maximum	**Pass**
Tensile strength (psi)	17195 psi	20000 (psi) maximum	**Pass**
% elongation	22.78%	15.0% minimum	**Pass**
Copper thickness (minimum)	0.00148” = 4.6% of wire radius	minimum copper thickness= 3.5% of wire radius	**Pass**
Copper volume	10.05%	8% minimum 12% maximum	**Pass**
Adhesion test	No separation (see attached image 1)	The wire shall be repeatedly reverse bent to fracture by any convenient means. The copper clad aluminum wire shall be free from cladding delamination.	**Pass**
Cohesion test	No seams or splits (see attached images 2 and 3)	The copper clad aluminum wire shall be free from seams or splits	**Pass**

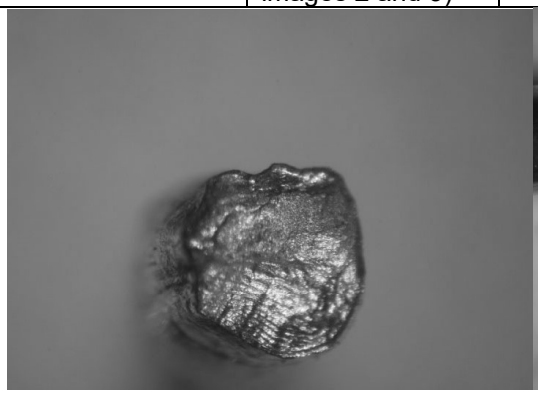


Image 1: adhesion test

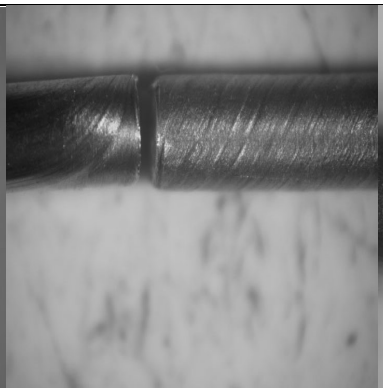


Image 2: cohesion test (torsion)

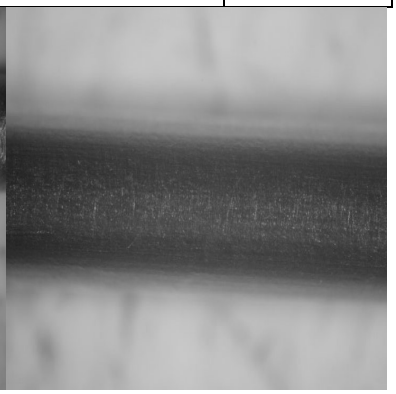


image 3: cohesion test (reverse torsion)

Test and measurement equipment

Equipment	Gauge ID	In calibration	Next due calibration
Micrometer	**CP-01**	**Yes**	**April 2021**
Tensile tester	**1755-2000**	**Yes**	**January 2022**
Ohmmeter	**62-1625**	**Yes**	**December 2020**
Calibration Certificates Attached below			

PRECISION CALIBRATION SYSTEMS
107 N Porter St
Winchester, TN 37398
E-mail: info@pcsllctn.com
Phone: 866-521-3823
Website: www.pcsllctn.com

INSTRUMENT CALIBRATION REPORT

Copperweld

Instrument ID CP-01
Description Micrometer
Calibrated 8/3/2020
Performed At Customer Location

Manufacturer Mitutoyo
Model Number 293-344-30
Serial Number 66936496
Cal Procedure QS0003JB2010
Location Main
Building 254 Cotton Mill Rd. Fayetteville, TN 37334
Department Quality
Status In Service
Frequency Semi-Annual
Certificate # CO080320JM-03
Temp 73°F
Humidity 59%

Calibration Specifications

Group # 1
Group Name OD

Nom In Val / In Val	In Type	Std Accy	Acc %	+/-	Out Val	Out Type	Fnd As	Lft As	In Tol
0.25000 / 0.25000	Inch	Plus / Minus	0.000000	±0.00010	0.25000	Inch	0.25000	0.25000	Yes
0.50000 / 0.50000	Inch	Plus / Minus	0.000000	±0.00010	0.50000	Inch	0.50000	0.50000	Yes
1.00000 / 1.00000	Inch	Plus / Minus	0.000000	±0.00010	1.00000	Inch	1.00000	1.00000	Yes

Test Instruments Used During the Calibration

Test Instrument ID	Description	Manufacturer	Model Number	Serial Number	(As Of Cal Entry Date) Last Cal Date	Next Cal Date
Z-GA-010 GAGE BLCK SET STD SHOP	Gage Block 81pc Set Standard	China	Rectangular Steel	E1599	4/8/2016	4/30/2021

Notes about this calibration

Uncertainty = ± (64.9+5.2L) µin (95%CL; K=2)

Calibration Result Calibration Successful
Who Calibrated James Meadows
Finalized By James Meadows
Date Finalized 8/3/2020 9:19:05AM

Total expanded measurement uncertainties expressed are based on a confidence level of 95%, coverage factor of (k=2). Decision Rule: The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. This is considered "shared responsibility." This calibration was conducted using standards traceable to the SI through NIST. The results on this certificate of accuracy apply only to the item described above. Accredited to ISO/IEC 17025: 2017.

Laboratory Authorized Signature

Revision Date:05/08/2020
Rev: 04

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QF0016

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107 N Porter St
Winchester, TN 37398
E-mail: info@pcsllctn.com
Phone: 866-521-3823
Website: www.pcsllctn.com

INSTRUMENT CALIBRATION REPORT

Copperweld

Instrument ID 1755-2000
Description Tensile Tester (2 Load cells)
Calibrated 8/4/2020
Performed At Customer Location

Manufacturer Thwing-Albert Instruments
Model Number EJA
Serial Number 1755-2000
Cal Procedure QS0033BG2013
Location Main
Building 254 Cotton Mill Rd. Fayetteville, TN 37334
Department Quality
Status In Service
Frequency Semi-Annual
Certificate # CO080420JM-13
Temp 70°F
Humidity 57%

Calibration Specifications

Group # 1
Group Name 0-11lb Load Cell 627022

Nom In Val / In Val	In Type	Std Accy	Acc %	+/-	Out Val	Out Type	Fnd As	Lft As	In Tol
1 / 1	lbf	Pct of Range	0.500000	0.00	1.00	lbf	1.01	1.01	Yes
2 / 2	lbf	Pct of Range	0.500000	0.00	2.00	lbf	2.01	2.01	Yes
3 / 3	lbf	Pct of Range	0.500000	0.00	3.00	lbf	3.01	3.01	Yes
5 / 5	lbf	Pct of Range	0.500000	0.00	5.00	lbf	5.02	5.02	Yes
7 / 7	lbf	Pct of Range	0.500000	0.00	7.00	lbf	7.03	7.03	Yes
10 / 10	lbf	Pct of Range	0.500000	0.00	10.00	lbf	10.04	10.04	Yes

Group # 2
Group Name 0-225 lb Load cell 608236

Nom In Val / In Val	In Type	Std Accy	Acc %	+/-	Out Val	Out Type	Fnd As	Lft As	In Tol
5 / 5	lbf	Pct of Range	0.500000	0.00	5.00	lbf	5.00	5.00	Yes
20.446 / 20.446	lbf	Pct of Range	0.500000	0.00	20.45	lbf	20.48	20.48	Yes
50.414 / 50.414	lbf	Pct of Range	0.500000	0.00	50.41	lbf	50.48	50.48	Yes
88.532 / 88.532	lbf	Pct of Range	0.500000	0.00	88.53	lbf	88.64	88.64	Yes
99.044 / 99.044	lbf	Pct of Range	0.500000	0.00	99.04	lbf	99.15	99.15	Yes
117.60 / 117.60	lbf	Pct of Range	0.500000	0.00	117.60	lbf	117.73	117.73	Yes
131.71 / 131.71	lbf	Pct of Range	0.500000	0.00	131.71	lbf	131.83	131.83	Yes
151.04 / 151.04	lbf	Pct of Range	0.500000	0.00	151.04	lbf	151.22	151.22	Yes
161.19 / 161.19	lbf	Pct of Range	0.500000	0.00	161.19	lbf	161.38	161.38	Yes
207.76 / 207.76	lbf	Pct of Range	0.500000	0.00	207.76	lbf	207.99	207.99	Yes

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Phone: 866-521-3823
Website: www.pcsllctn.com

INSTRUMENT CALIBRATION REPORT

Copperweld

Instrument ID 1755-2000
Description Tensile Tester (2 Load cells)
Calibrated 8/4/2020
Performed At Customer Location

Test Instruments Used During the Calibration

Test Instrument ID	Description	Manufacturer	Model Number	Serial Number	(As Of Cal Entry Date) Last Cal Date	Next Cal Date
Z-LO-005 5K LOAD CELL	Load Cell, 5000lb, Tension & Compression	Futek	LSB453	575093	1/7/2020	1/31/2022
Z-WE-003 HANGING WEIGHTS	Weight Set, 1-20lbs, Cast Iron	Rice Lake	ASTM Class 6	D7-D10 (20), D1-D4 (10), D1-D2 (2), 8MD8 (1), 8MB4 (2),8MB5 (5)	3/26/2019	3/31/2021

Notes about this calibration
Uncertainty = ± 0.23% of Reading (95%CL; K=2)

Calibration Result Calibration Successful
Who Calibrated James Meadows
Finalized By James Meadows
Date Finalized 8/4/2020 1:12:08PM

Total expanded measurement uncertainties expressed are based on a confidence level of 95%, coverage factor of (k=2). Decision Rule: The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. This is considered "shared responsibility." This calibration was conducted using standards traceable to the SI through NIST. The results on this certificate of accuracy apply only to the item described above. Accredited to ISO/IEC 17025: 2017.

Laboratory Authorized Signature

PCS PRECISION CALIBRATION SYSTEMS
107 N Porter St
Winchester, TN 37398
E-mail: info@pcsllctn.com
Phone: 866-521-3823
Website: www.pcsllctn.com

INSTRUMENT CALIBRATION REPORT

Copperweld

Instrument ID 62-1625
Description Micro Ohm Meter
Calibrated 8/4/2020
Performed At Customer Location

Manufacturer Valhalla Scientific
Model Number 4176
Serial Number 62-1625
Cal Procedure QS0011JB2010
Location Main
Building 254 Cotton Mill Rd. Fayetteville, TN 37334
Department Quality
Status In Service
Frequency Semi-Annual
Certificate # CO080420JM-03
Temp 70°F
Humidity 57%

Calibration Specifications

Group # 1
Group Name Ohm - Source

Nom In Val / In Val	In Type	Std Accy	Acc %	+/-	Out Val	Out Type	End As	Lft As	In Tol
1.000 / 1.000	Ohm	Pct of Reading	0.040000	0.0000	1.0000	Ohm	0.9998	0.9998	Yes
10.000 / 10.000	Ohm	Pct of Reading	0.040000	0.000	10.000	Ohm	9.999	9.999	Yes
100.000 / 100.000	Ohm	Pct of Reading	0.040000	0.00	100.00	Ohm	99.99	99.99	Yes

Test Instruments Used During the Calibration

Test Instrument ID	Description	Manufacturer	Model Number	Serial Number	(As Of Cal Entry Date) Last Cal Date	Next Cal Date
Z-EL-020 DECADE RESISTANCE BOX	General Radio Small Decade Resistance Box	General Radio	1433-U	2545	12/18/2018	12/31/2020

Notes about this calibration

Uncertainty = ± 2 mOhm (95%CL; K=2)

Calibration Result Calibration Successful
Who Calibrated James Meadows
Finalized By James Meadows
Date Finalized 8/4/2020 12:47:33PM

Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). Decision Rule: The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. This is considered "shared responsibility." This calibration was conducted using standards traceable to the SI through NIST. The results on this certificate of accuracy apply only to the item described above. Accredited to ISO/IEC 17025: 2017.

Laboratory Authorized Signature

Revision Date:05/08/2020
Rev: 04

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QF0016

Follow-up Service Inspection Report
E491185 1200827165202

INSPECTION DETAILS			
Date:	2020-08-27	File Number.:	E491185
Responsible Office:	Melville	Volume:	1
Inspection Center:	232	CCN:	DVVU2
Product Type:	CCA Conductor	UL Rep Name:	Gregory Cornett
Deliverable Type:	Recognized	UL Rep ID:	20708
Party Site Number:	1626131	Subscriber Factory No.:	
Manufacturer Name:	Copperweld Bimetallics LLC	Factory Rep Name	Mr. Sammy Hampton
Manufacturer Address:	254 Cotton Mill Rd Fayetteville, TN 37334	Factory Rep Phone:	931-433-0495
		Factory Rep Email:	shampton@copperweld.com
Nature of visit:	Regular Inspection	Sample Status:	Sample requirements fulfilled for sample period
UL Marks Used?	Yes	UL Marks Removed?	No
Variation Notice Issued?	No	Inspection Conducted Remotely?	Yes
Comments After Submission:			

PRODUCT DOCUMENTS/PRODUCTION READY VISIT			
Model	**Product**	**Section**	**Multiple Listed**
14 Awg Class 10A	Copper Clad Aluminum	1	No

SAMPLE DOCUMENTS			
If samples are required to be sent to UL, indicate below. If required samples are not sent, explain in the Comments area.			
No Samples			
Additional Comments	14 Awg conductors from the NMB and THHN samples passed the UL tests for DVVU2, including Tensile, Elongation, copper thickness and DC Resistance.		

In addition to the requirements specified in the applicable UL Services agreement and Follow-Up Service Procedure, UL further defines responsibilities, duties and requirements for both manufacturers and UL representatives in the document titled "UL Mark Surveillance Requirements" that can be located at www.ul.com/fus, and in accordance with the applicable terms and conditions of the document at www.ul.com/responsibilities. Manufacturers without Internet access may obtain the current versions of these documents from their local UL customer service representative or UL field representative.

Test #5; Wiring Device Thermal Cycling tests with Copper 14awg wire with Mfg. 10 and Mfg. 9 receptacles at 40A:

data logger CH #	Location	Recorded Temperature (°C)													average
cycle #	→	25	50	75	100	125	130	170	215	260	340	420	500	525	
1a	Mfg. 10 - 1	101.71	101.64	103.31	no data	no data	99.60	99.29	99.78	101.04	101.26	98.88	99.63	100.47	100.60
2a	Mfg. 10 - 2	106.08	108.49	108.38	no data	no data	108.20	106.11	106.46	103.40	106.82	107.87	107.04	108.32	107.02
3a	Mfg. 10 - 3	86.84	88.70	88.32	no data	no data	89.04	86.73	86.92	82.52	85.29	88.23	86.42	87.37	86.94
4a	Mfg. 9 - 1	98.51	101.13	100.59	no data	no data	99.49	97.48	98.09	98.18	98.71	97.88	96.98	97.73	98.62
5a	Mfg. 9 - 2	105.21	105.04	105.10	no data	no data	101.65	102.00	102.41	101.82	103.30	99.02	100.81	101.59	102.54
6a	Mfg. 9 - 3	90.81	91.88	92.16	no data	no data	89.66	90.26	92.91	91.22	91.29	87.43	91.67	101.00	91.84
8a	line wire	118.77	115.34	116.50	no data	no data	116.03	112.96	114.17	117.50	111.59	110.94	115.59	114.04	114.86
9a	line wire splicing device	113.83	120.93	121.41	no data	no data	123.77	119.19	118.41	116.56	119.75	120.32	121.05	120.91	119.65
10a	load wire	106.81	109.20	109.94	no data	no data	106.41	105.53	106.38	109.85	107.26	102.73	105.44	104.96	106.77
11a	load wire splicing device	102.27	111.17	111.60	no data	no data	104.05	97.47	98.51	109.16	97.41	95.49	104.82	104.52	103.32
12a	room ambient (°C)	22.19	21.52	21.86	no data	no data	21.15	20.87	21.16	22.02	20.98	20.63	20.81	20.84	21.28
13a	current (amps)	40.06	40.06	40.11	no data	no data	40.11	40.30	40.19	40.00	40.21	40.20	40.05	40.05	40.12
	Ambient Temp. Difference from Average	0.91	0.24	0.58	no data	no data	-0.13	-0.41	-0.12	0.74	-0.30	-0.65	-0.47	-0.44	

(See 5.5.2 for explanation of yellow highlighted “no data” entries.)

Test #5; Wiring Device Thermal Cycling tests with Copper 14awg wire with Mfg. 10 and Mfg. 9 receptacles at 40A:

data logger CH #	Location	Receptacles Calc Temp Rise from Ambinet (°C) / Wire Splicing Devices Calc Temp Differential from Line Conductor													average
cycle # →		25	50	75	100	125	130	170	215	260	340	420	500	525	
1a	Mfg. 10 - 1	79.52	80.12	81.45	no data	no data	78.45	78.42	78.62	79.02	80.28	78.25	78.82	79.63	79.33
2a	Mfg. 10 - 2	83.89	86.97	86.52	no data	no data	87.05	85.24	85.30	81.38	85.84	87.24	86.23	87.48	85.74
3a	Mfg. 10 - 3	64.65	67.18	66.46	no data	no data	67.89	65.86	65.76	60.50	64.31	67.60	65.61	66.53	65.67
4a	Mfg. 9 - 1	76.32	79.61	78.73	no data	no data	78.34	76.61	76.93	76.16	77.73	77.25	76.17	76.89	77.34
5a	Mfg. 9 - 2	83.02	83.52	83.24	no data	no data	80.50	81.13	81.25	79.80	82.32	78.39	80.00	80.75	81.27
6a	Mfg. 9 - 3	68.62	70.36	70.30	no data	no data	68.51	69.39	71.75	69.20	70.31	66.80	70.86	80.16	70.57
8a	line wire														
9a	line wire splicing device	-4.94	5.59	4.91	no data	no data	7.74	6.23	4.24	-0.94	8.16	9.38	5.46	6.87	4.79
10a	load wire														
11a	load wire splicing device	-16.50	-4.17	-4.90	no data	no data	-11.98	-15.49	-15.66	-8.34	-14.18	-15.45	-10.77	-9.52	-11.54

(See 5.5.2 for explanation of yellow highlighted “no data” entries.)

Test #5; Wiring Device Thermal Cycling tests with Copper 14awg wire with Mfg. 10 and Mfg. 9 receptacles at 40A:

data logger CH #	Location	Stability Factor												
Cycle #		25	50	75	100	125	130	170	215	260	340	420	500	525
1a	Mfg. 10 - 1	0.19	0.79	2.12	no data	no data	-0.88	-0.91	-0.71	-0.31	0.95	-1.08	-0.51	0.30
2a	Mfg. 10 - 2	-1.85	1.23	0.78	no data	no data	1.31	-0.50	-0.44	-4.36	0.10	1.50	0.49	1.74
3a	Mfg. 10 - 3	-1.02	1.51	0.79	no data	no data	2.22	0.19	0.09	-5.17	-1.36	1.93	-0.06	0.86
4a	Mfg. 9 - 1	-1.02	2.27	1.39	no data	no data	1.00	-0.73	-0.41	-1.18	0.39	-0.09	-1.17	-0.45
5a	Mfg. 9 - 2	1.75	2.25	1.97	no data	no data	-0.77	-0.14	-0.02	-1.47	1.05	-2.88	-1.27	-0.52
6a	Mfg. 9 - 3	-1.95	-0.21	-0.27	no data	no data	-2.06	-1.18	1.18	-1.37	-0.26	-3.77	0.29	9.59
8a	line wire													
9a	line wire splicing device	-9.73	0.80	0.12	no data	no data	2.95	1.44	-0.55	-5.73	3.37	4.59	0.67	2.08
10a	load wire													
11a	load wire splicing device	-4.96	7.37	6.64	no data	no data	-0.44	-3.95	-4.12	3.20	-2.64	-3.91	0.77	2.02

(See 5.5.2 for explanation of yellow highlighted “no data” entries.)

Test #5; Wiring Device Thermal Cycling tests with Copper 14awg wire with Mfg. 11 and Mfg. 8 receptacles at 40A:

data logger CH #	Location	Recorded Temperature (°C)													average
cycle #	→	25	50	75	100	125	130	170	215	260	340	420	500	525	
1b	Mfg. 11 - 1	86.23	86.35	86.84	no data	no data	85.53	84.24	84.41	85.17	84.16	84.22	84.25	84.49	85.08
2b	Mfg. 11 - 2	84.34	84.59	85.28	no data	no data	85.22	82.92	83.34	83.12	82.63	83.99	83.38	83.52	83.85
3b	Mfg. 11 - 3	73.84	74.56	74.44	no data	no data	75.93	73.25	73.57	72.27	71.86	75.29	73.44	74.26	73.88
4b	Mfg. 8 - 1	87.65	88.67	88.73	no data	no data	88.79	87.11	87.48	86.41	87.02	87.59	87.70	88.16	87.76
5b	Mfg. 8 - 2	93.60	93.20	94.10	no data	no data	92.96	92.04	92.31	92.40	92.15	92.74	91.52	92.07	92.64
6b	Mfg. 8 - 3	84.90	87.27	86.43	no data	no data	88.34	86.47	86.56	83.25	84.84	88.38	86.11	87.73	86.39
8b	line wire	103.03	100.21	100.67	no data	no data	97.02	94.39	95.31	100.77	93.25	92.30	92.84	92.50	96.57
9b	line wire splicing device	79.15	81.25	81.87	no data	no data	79.51	78.76	79.50	81.80	79.66	78.36	79.94	78.86	79.88
10b	load wire	95.24	95.06	96.18	no data	no data	92.55	91.91	92.21	94.43	92.09	90.55	91.62	91.13	93.00
11b	load wire splicing device	95.02	99.85	99.32	no data	no data	95.89	92.86	94.22	100.13	94.08	94.04	97.19	96.97	96.32
12b	room ambient	22.21	21.53	21.90	no data	no data	21.09	20.91	21.32	21.94	21.08	20.63	20.80	21.14	21.32
13a	current (amps)	40.06	40.06	40.11	no data	no data	40.11	40.30	40.19	40.00	40.21	40.20	40.05	40.05	40.12
	Ambient Difference from Average	0.89	0.21	0.58	no data	no data	-0.23	-0.41	0.00	0.62	-0.24	-0.69	-0.52	-0.18	

(See 5.5.2 for explanation of yellow highlighted “no data” entries.)

Test #5; Wiring Device Thermal Cycling tests with Copper 14awg wire with Mfg. 11 and Mfg. 8 receptacles at 40A:

data logger CH #	Location	Receptacles Calc Temp Rise from Ambinet (°C) / Wire Splicing Devices Calc Temp Differential from Line Conductor													average
cycle # →		25	50	75	100	125	130	170	215	260	340	420	500	525	
1b	Mfg. 11 - 1	64.02	64.82	64.94	no data	no data	64.44	63.33	63.09	63.23	63.08	63.59	63.45	63.35	63.76
2b	Mfg. 11 - 2	62.13	63.06	63.38	no data	no data	64.13	62.01	62.02	61.18	61.55	63.36	62.58	62.38	62.53
3b	Mfg. 11 - 3	51.63	53.03	52.54	no data	no data	54.84	52.34	52.25	50.33	50.78	54.66	52.64	53.12	52.56
4b	Mfg. 8 - 1	65.44	67.14	66.83	no data	no data	67.70	66.20	66.16	64.47	65.94	66.96	66.90	67.02	66.43
5b	Mfg. 8 - 2	71.39	71.67	72.20	no data	no data	71.87	71.13	70.99	70.46	71.07	72.11	70.72	70.93	71.32
6b	Mfg. 8 - 3	62.69	65.74	64.53	no data	no data	67.25	65.56	65.24	61.31	63.76	67.75	65.31	66.59	65.07
8b	line wire														
9b	line wire splicing device	-23.88	-18.96	-18.80	no data	no data	-17.51	-15.63	-15.81	-18.97	-13.59	-13.94	-12.90	-13.64	-16.69
10b	load wire														
11b	load wire splicing device	-8.01	-0.36	-1.35	no data	no data	-1.13	-1.53	-1.09	-0.64	0.83	1.74	4.35	4.47	-0.25

(See 5.5.2 for explanation of yellow highlighted “no data” entries.)

Test #5; Wiring Device Thermal Cycling tests with Copper 14awg wire with Mfg. 11 and Mfg. 8 receptacles at 40A:

data logger CH #	Location	Stability Factor												
cycle # →		25	50	75	100	125	130	170	215	260	340	420	500	525
1b	Mfg. 11 - 1	0.26	1.06	1.18	no data	no data	0.68	-0.43	-0.67	-0.53	-0.68	-0.17	-0.31	-0.41
2b	Mfg. 11 - 2	-0.40	0.53	0.85	no data	no data	1.60	-0.52	-0.51	-1.35	-0.98	0.83	0.05	-0.15
3b	Mfg. 11 - 3	-0.93	0.47	-0.02	no data	no data	2.28	-0.22	-0.31	-2.23	-1.78	2.10	0.08	0.56
4b	Mfg. 8 - 1	-0.99	0.71	0.40	no data	no data	1.27	-0.23	-0.27	-1.96	-0.49	0.53	0.47	0.59
5b	Mfg. 8 - 2	0.07	0.35	0.88	no data	no data	0.55	-0.19	-0.33	-0.86	-0.25	0.79	-0.60	-0.39
6b	Mfg. 8 - 3	-2.38	0.67	-0.54	no data	no data	2.18	0.49	0.17	-3.76	-1.31	2.68	0.24	1.52
8b	line wire				no data	no data								
9b	line wire splicing device	-7.19	-2.27	-2.11	no data	no data	-0.82	1.06	0.88	-2.28	3.10	2.75	3.79	3.05
10b	load wire				no data	no data								
11b	load wire splicing device	-7.76	-0.11	-1.10	no data	no data	-0.88	-1.28	-0.84	-0.39	1.08	1.99	4.60	4.72

(See 5.5.2 for explanation of yellow highlighted “no data” entries.)

Test #5; Wiring Device Thermal Cycling tests with Copper-clad 14awg wire with Mfg. 10 and Mfg. 9 receptacles at 26.67A:

data logger CH #	Location	Recorded Temperature (°C)													average
cycle # →		25	50	75	100	125	130	170	215	260	340	420	500	525	
1c	Mfg. 10 - 1	69.16	68.03	69.28	no data	no data	67.96	67.50	67.44	68.59	67.59	68.68	67.91	67.72	68.17
2c	Mfg. 10 - 2	70.05	68.90	70.64	no data	no data	68.79	68.52	68.33	68.83	68.34	69.13	67.56	68.74	68.89
3c	Mfg. 10 - 3	65.24	64.21	65.83	no data	no data	63.32	63.64	63.72	64.27	63.44	64.83	63.53	63.85	64.17
4c	Mfg. 9 - 1	63.58	62.02	63.64	no data	no data	62.23	61.77	61.91	62.69	61.93	62.95	61.81	62.23	62.43
5c	Mfg. 9 - 2	68.66	68.04	68.35	no data	no data	68.31	67.48	67.32	68.53	67.80	68.39	67.80	67.63	68.03
6c	Mfg. 9 - 3	64.53	62.76	64.56	no data	no data	63.17	62.50	62.76	64.08	63.04	63.70	67.42	67.58	64.19
8c	line wire	95.90	95.18	96.89	no data	no data	94.12	95.12	95.44	93.96	95.78	95.00	93.58	95.15	95.10
9c	line wire splicing device	76.51	75.45	76.02	no data	no data	75.24	74.49	74.15	76.82	75.21	77.42	75.64	73.31	75.48
10c	load wire	77.76	77.59	77.43	no data	no data	77.15	75.91	75.93	79.65	76.52	78.82	77.30	75.05	77.19
11c	load wire splicing device	88.90	88.39	88.45	no data	no data	87.92	86.72	86.15	90.73	87.13	89.96	88.69	86.02	88.10
12c	room ambient	22.13	21.37	21.77	no data	no data	20.98	20.75	21.04	21.88	20.86	20.56	20.78	20.74	21.17
13c	current (amps)	26.61	26.74	26.73	no data	no data	26.69	26.77	26.73	26.57	26.72	26.71	26.63	26.69	26.69
	Ambient Difference from Average	0.96	0.20	0.60	no data	no data	-0.19	-0.42	-0.13	0.71	-0.31	-0.61	-0.39	-0.43	

(See 5.5.2 for explanation of yellow highlighted “no data” entries.)

Test #5; Wiring Device Thermal Cycling tests with Copper-clad 14awg wire with Mfg. 10 and Mfg. 9 receptacles at 26.67A:

data logger CH #	Location	Receptacles Calc Temp Rise from Ambinet (°C) / Wire Splicing Devices Calc Temp Differential from Line Conductor													average
cycle # →		25	50	75	100	125	130	170	215	260	340	420	500	525	
1c	Mfg. 10 - 1	47.03	46.66	47.51	no data	no data	46.98	46.75	46.40	46.71	46.73	48.12	47.13	46.98	47.00
2c	Mfg. 10 - 2	47.92	47.53	48.87	no data	no data	47.81	47.77	47.29	46.95	47.48	48.57	46.78	48.00	47.72
3c	Mfg. 10 - 3	43.11	42.84	44.06	no data	no data	42.34	42.89	42.68	42.39	42.58	44.27	42.75	43.11	43.00
4c	Mfg. 9 - 1	41.45	40.65	41.87	no data	no data	41.25	41.02	40.87	40.81	41.07	42.39	41.03	41.49	41.26
5c	Mfg. 9 - 2	46.53	46.67	46.58	no data	no data	47.33	46.73	46.28	46.65	46.94	47.83	47.02	46.89	46.86
6c	Mfg. 9 - 3	42.40	41.39	42.79	no data	no data	42.19	41.75	41.72	42.20	42.18	43.14	46.64	46.84	43.02
8c	line wire														
9c	line wire splicing device	-19.39	-19.73	-20.87	no data	no data	-18.88	-20.63	-21.29	-17.14	-20.57	-17.58	-17.94	-21.84	-19.62
10c	load wire														
11c	load wire splicing device	-7.00	-6.79	-8.44	no data	no data	-6.20	-8.40	-9.29	-3.23	-8.65	-5.04	-4.89	-9.13	-7.01

(See 5.5.2 for explanation of yellow highlighted “no data” entries.)

Test #5; Wiring Device Thermal Cycling tests with Copper-clad 14awg wire with Mfg. 10 and Mfg. 9 receptacles at 26.67A:

data logger CH #	Location	Stability Factor												
cycle # →		25	50	75	100	125	130	170	215	260	340	420	500	525
1c	Mfg. 10 - 1	0.03	-0.34	0.51	no data	no data	-0.02	-0.25	-0.60	-0.29	-0.27	1.12	0.13	-0.02
2c	Mfg. 10 - 2	0.20	-0.19	1.15	no data	no data	0.09	0.05	-0.43	-0.77	-0.24	0.85	-0.94	0.28
3c	Mfg. 10 - 3	0.11	-0.16	1.06	no data	no data	-0.66	-0.11	-0.32	-0.61	-0.42	1.27	-0.25	0.11
4c	Mfg. 9 - 1	0.19	-0.61	0.61	no data	no data	-0.01	-0.24	-0.39	-0.45	-0.19	1.13	-0.23	0.23
5c	Mfg. 9 - 2	-0.33	-0.19	-0.28	no data	no data	0.47	-0.13	-0.58	-0.21	0.08	0.97	0.16	0.03
6c	Mfg. 9 - 3	-0.62	-1.63	-0.23	no data	no data	-0.83	-1.27	-1.30	-0.82	-0.84	0.12	3.62	3.82
8c	line wire													
9c	line wire splicing device	0.23	-0.11	-1.25	no data	no data	0.74	-1.01	-1.67	2.48	-0.95	2.04	1.68	-2.22
10c	load wire													
11c	load wire splicing device	0.01	0.22	-1.43	no data	no data	0.81	-1.39	-2.28	3.78	-1.64	1.97	2.12	-2.12

(See 5.5.2 for explanation of yellow highlighted “no data” entries.)

Test #5; Wiring Device Thermal Cycling tests with Copper-clad 14awg wire with Mfg. 11 and Mfg. 8 receptacles at 26.67A:

data logger CH #	Location	Recorded Temperature (°C)													average
cycle # →		25	50	75	100	125	130	170	215	260	340	420	500	525	
1d	Mfg. 11 - 1	60.89	60.43	61.16	no data	no data	59.33	59.49	59.60	60.16	59.12	59.72	59.35	58.20	59.77
2d	Mfg. 11 - 2	64.73	63.33	64.85	no data	no data	61.72	62.07	62.22	62.60	61.57	62.85	62.56	62.36	62.81
3d	Mfg. 11 - 3	57.50	55.44	57.81	no data	no data	54.73	54.94	56.12	55.18	54.41	55.93	55.01	55.69	55.71
4d	Mfg. 8 - 1	62.66	61.45	62.87	no data	no data	61.20	61.09	61.01	62.08	60.69	61.28	60.61	61.14	61.46
5d	Mfg. 8 - 2	62.72	62.13	62.84	no data	no data	60.91	61.20	61.28	62.18	60.90	62.00	61.28	60.95	61.67
6d	Mfg. 8 - 3	62.55	61.25	62.88	no data	no data	59.57	60.16	60.25	61.54	60.06	61.11	60.58	60.60	60.96
8d	line wire	83.80	83.00	83.71	no data	no data	82.14	82.00	82.02	82.71	81.99	83.16	81.44	80.54	82.41
9d	line wire splicing device	74.75	75.04	75.10	no data	no data	73.26	72.71	72.37	77.18	73.34	75.18	76.06	72.67	74.33
10d	load wire	78.44	77.66	79.26	no data	no data	77.09	76.83	76.65	77.79	76.48	77.82	77.01	75.92	77.36
11d	load wire splicing device	73.94	74.81	74.46	no data	no data	72.78	71.48	71.57	75.43	71.68	73.53	74.32	70.95	73.18
12d	room ambient	22.70	21.79	22.27	no data	no data	21.28	21.21	21.53	22.24	21.23	20.88	21.09	21.23	21.59
13c	current (amps)	26.61	26.74	26.73	no data	no data	26.69	26.77	26.73	26.57	26.72	26.71	26.63	26.69	26.69
	Ambient Difference from Average	1.11	0.20	0.68	no data	no data	-0.31	-0.38	-0.06	0.65	-0.36	-0.71	-0.50	-0.36	

(See 5.5.2 for explanation of yellow highlighted “no data” entries.)

Test #5; Wiring Device Thermal Cycling tests with Copper-clad 14awg wire with Mfg. 11 and Mfg. 8 receptacles at 26.67A:

data logger CH #	Location	Receptacles Calc Temp Rise from Ambinet (°C) / Wire Splicing Devices Calc Temp Differential from Line Conductor													average
cycle # →		25	50	75	100	125	130	170	215	260	340	420	500	525	
1d	Mfg. 11 - 1	38.19	38.64	38.89	no data	no data	38.05	38.28	38.07	37.92	37.89	38.84	38.26	36.97	38.18
2d	Mfg. 11 - 2	42.03	41.54	42.58	no data	no data	40.44	40.86	40.69	40.36	40.34	41.97	41.47	41.13	41.22
3d	Mfg. 11 - 3	34.80	33.65	35.54	no data	no data	33.45	33.73	34.59	32.94	33.18	35.05	33.92	34.46	34.12
4d	Mfg. 8 - 1	39.96	39.66	40.60	no data	no data	39.92	39.88	39.48	39.84	39.46	40.40	39.52	39.91	39.88
5d	Mfg. 8 - 2	40.02	40.34	40.57	no data	no data	39.63	39.99	39.75	39.94	39.67	41.12	40.19	39.72	40.09
6d	Mfg. 8 - 3	39.85	39.46	40.61	no data	no data	38.29	38.95	38.72	39.30	38.83	40.23	39.49	39.37	39.37
8d	line wire														
9d	line wire splicing device	-9.05	-7.96	-8.61	no data	no data	-8.88	-9.29	-9.65	-5.53	-8.65	-7.98	-5.38	-7.87	-8.08
10d	load wire														
11d	load wire splicing device	-9.86	-8.19	-9.25	no data	no data	-9.36	-10.52	-10.45	-7.28	-10.31	-9.63	-7.12	-9.59	-9.23

(See 5.5.2 for explanation of yellow highlighted “no data” entries.)

Test #5; Wiring Device Thermal Cycling tests with Copper-clad 14awg wire with Mfg. 11 and Mfg. 8 receptacles at 26.67A:

data logger CH #	Location	Stability Factor												
cycle # →		25	50	75	100	125	130	170	215	260	340	420	500	525
1d	Mfg. 11 - 1	0.01	0.46	0.71	no data	no data	-0.13	0.10	-0.11	-0.26	-0.29	0.66	0.08	-1.21
2d	Mfg. 11 - 2	0.81	0.32	1.36	no data	no data	-0.78	-0.36	-0.53	-0.86	-0.88	0.75	0.25	-0.09
3d	Mfg. 11 - 3	0.68	-0.47	1.42	no data	no data	-0.67	-0.39	0.47	-1.18	-0.94	0.93	-0.20	0.34
4d	Mfg. 8 - 1	0.08	-0.22	0.72	no data	no data	0.04	0.00	-0.40	-0.04	-0.42	0.52	-0.36	0.03
5d	Mfg. 8 - 2	-0.07	0.25	0.48	no data	no data	-0.46	-0.10	-0.34	-0.15	-0.42	1.03	0.10	-0.37
6d	Mfg. 8 - 3	0.48	0.09	1.24	no data	no data	-1.08	-0.42	-0.65	-0.07	-0.54	0.86	0.12	0.00
8d	line wire													
9d	line wire splicing device	-0.97	0.12	-0.53	no data	no data	-0.80	-1.21	-1.57	2.55	-0.57	0.10	2.70	0.21
10d	load wire													
11d	load wire splicing device	-0.63	1.04	-0.02	no data	no data	-0.13	-1.29	-1.22	1.95	-1.08	-0.40	2.11	-0.36

(See 5.5.2 for explanation of yellow highlighted “no data” entries.)

Appendix J – Pull Out Test Results

Test #5; Post Thermal Cycling tests - 20 pound pull-out test on receptacle terminal wire for 1 minute duration:

type of 14awg wire being tested	receptacle ID	thermocouple ID #	Test group #	pull-out test on hot wire	pull-out test on neutral
Copper	Mfg. 10 -	1	A	passed	passed
Copper	Mfg. 10 -	2	A	passed	passed
Copper	Mfg. 10 -	3	A	passed	passed
Copper	Mfg. 9 -	4	A	passed	passed
Copper	Mfg. 9 -	5	A	passed	passed
Copper	Mfg. 9 -	6	A	passed	passed
Copper	Mfg. 11 -	1	B	passed	passed
Copper	Mfg. 11 -	2	B	passed	passed
Copper	Mfg. 11 -	3	B	passed	passed
Copper	Mfg. 8 -	4	B	passed	passed
Copper	Mfg. 8 -	5	B	passed	passed
Copper	Mfg. 8 -	6	B	passed	passed
Copper-clad	Mfg. 10 -	1	C	passed	passed
Copper-clad	Mfg. 10 -	2	C	passed	passed
Copper-clad	Mfg. 10 -	3	C	passed	passed
Copper-clad	Mfg. 9 -	4	C	passed	passed
Copper-clad	Mfg. 9 -	5	C	passed	passed
Copper-clad	Mfg. 9 -	6	C	passed	passed
Copper-clad	Mfg. 11 -	1	D	passed	passed
Copper-clad	Mfg. 11 -	2	D	passed	passed
Copper-clad	Mfg. 11 -	3	D	passed	passed
Copper-clad	Mfg. 8 -	4	D	passed	passed
Copper-clad	Mfg. 8 -	5	D	passed	passed
Copper-clad	Mfg. 8 -	6	D	passed	passed

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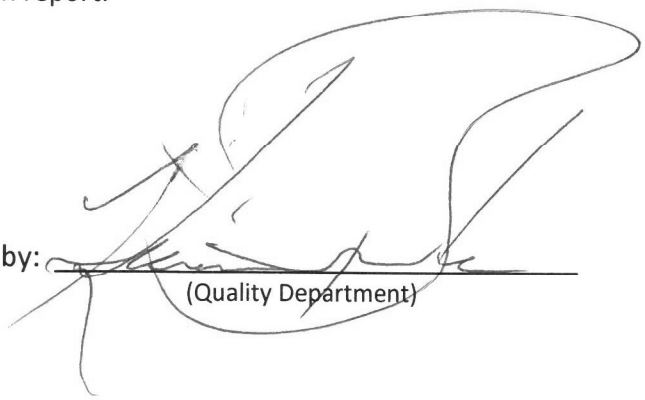
Certificate of Conformance

Issued to:	CDCMello Consulting LLC PO Box 872317 Vancouver, WA 98687
Customer PO:	Verbal Chuck Mello
Model:	UL3055
Lot Number:	952103-019
Report:	JK202006300-003
Description:	Type J, 30 Gauge FEP/FEP Teflon, Special Limits of Error Tolerance, 15 feet length, Thermocouple

Pacific Test and Measurement Inc certifies that the order of thermocouples meets all applicable instructions, specifications, and in accordance with DAP UL 00-OP-C0037 version 10.0. The preferred method of welding to produce a single point weld or bead using ThermX model 258B welder has been used to assemble the thermocouple junction which has been proven as reliable and repeatable through validation. The finish products were assembled from UL4047, a spool of described wire calibrated to accredited standards as described in the calibration report.



Certified by: _____ Date: ___7-10-2020_____
(Quality Department)

ACCREDITED
CERT #2496.01

Report of Calibration

Eustis Co.,Inc./Pyrocom Calibration lab
12407-B Mukilteo Speedway #200
Lynnwood, wa 98087

Model: UL4047 Serial: 952103-019 Description: TYPE J, 30AWG, FEP/FEP	Customer: . . CDCMello Consulting LLC PO Box 872317 Vancouver, WA 98687
Calibration Range: Limited Received Condition: New Current: N/A Procedure: ECP 339/341	

The unit under test (UUT) on this certificate has been calibrated by comparison method as covered by ASTM E220-13, and calibrated against standards traceable to the National Institute of Standards and Technology (NIST). Eustis Co., Inc./Pyrocom Calibration Lab meets the requirements of ANSI/NCSL Z540-1-1994 and ISO/IEC 17025 and is accredited by A2LA via Certificate Number 2496.01 for calibrations within the scope to which it applies. The uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2. All results contained within this certificate relate only to the item calibrated. Any number of factors may cause the calibrated item to drift out of calibration.

Nominal Value (Set-point) (C)	Actual Value (Reference) (C)	UUT (Test Sensor) (C)	Error (C)	Measurement Uncertainty (C)	Method of Realization
21.00	21.41	21.38	-0.03	+/- 0.31	COMP
40.00	40.08	40.02	-0.06	+/- 0.40	COMP
95.00	95.02	94.97	-0.05	+/- 0.40	COMP
150.00	150.02	150.10	0.08	+/- 0.50	COMP
200.00	200.01	200.23	0.22	+/- 0.50	COMP

Test Equipment

Manufacturer	Model	Description	Serial Number	Recall Date
Hart Scientific	1560	"Black Stack" Base Unit	96539	NCR
Hart Scientific	2560	SPRT Module	A25631	3/24/2021
Fluke	5628	4 Wire SPRT	4303	3/26/2021
Fluke	2566	Thermocouple Scanner	B7A380	3/24/2021
Fluke	9173	Metrology Well, 700 C	B47975	NCR
Fluke	7380	Bath, Ultra Low-Temperature	B2A527	NCR

Calibration Date: 6/18/2020
Temperature: 23.0 C
Humidity: 47%
Customer Order: 74523

Technician: Julia Kulin

Approved By: Walter Paulson
QA Manager

Report of Calibration

Notes: The thermocouple wire meets or exceeds the criteria established for type "J" SPECIAL LIMITS OF ERROR per ASTM E230/E230M-17 table 1 & ISA-MC96.1-1982 Par. 2.5 Table 8 +/- 1.1°C OR +/- .4% whichever is greater. Lot calibration data supplied for your reference.
Calibrated item meets special limits of error for all results given according to the comparison of "error" reading to the specifications found in ASTM E230/E230M-17 table 1 & MC96.1-1982 table 8; acceptance determination is ultimately the responsibility of the customer, taking into account all uncertainties and other factors. The closer the results are to the specification limits, the greater the risk that the unit under test will be out of tolerance.

Report issue date: JUN 19 2020

Appendix K - Certificates of Calibration
(Appendix pages K1 to K26 identical to pages E1 to E26)

Fox Valley Metrology
3114 Medalist Drive
Oshkosh, WI 54902
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CERTIFICATE OF CALIBRATION

ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY
Certificate No. ACT-1272

Certification Number CK198-33105-466

For Eaton Corporation - ICD
W126 N7250 Flint Drive
Menomonee Falls, WI 53051

Purchase Order #	4044-671109
Test Instrument	Data Acquisition Unit
Make	Keysight
Model	34972A
Serial Number	MY49002695
Identification	EM7054
Customer Location	ICD
Condition Received	In Tolerance
Condition Returned	In Tolerance
Calibrated By	Alex Paulsen
Technical Review By	Tim Bending
Calibration Location	FVM
Calibration Conditions	67.8°F, 19.9°C, 57.3%RH
Calibration Date	07/16/2020
Recalibration Due	07/16/2021

Procedures Followed
FVE-000 rev. 2
FVE-006 rev. 2

Form Revision 6: 02/04/2012

Standards Used

Instrument	Serial Number	Trace Number	Next Cal
FVS-275A	RY11838	CJ191-70508-513	07/28/2020
FVS-737	4542903	CK041-57440-531	02/28/2021

Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. (This is considered "shared responsibility.") Uncertainties expressed in nominal units.

All instruments have been calibrated against standards traceable to NIST. Calibration was completed in accordance with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 and ANSI/NCSL Z540.3-2006. Other standards listed upon request.

* denotes "Out of Tolerance"

Calibration Results

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
Root Difference Square guardbanding method used.						
UUT IDENTIFICATION						
Serial Number: MY49002695 Firmware Level: 1.11-1.12-02-01						
INPUT MODULE CHARACTERISTICS						
Model: 34901A Firmware Level: 2.3						
SELF TEST				Pass	Pass	

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CERTIFICATE OF CALIBRATION

Certificate No. ACT-1272

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
INTERNAL DMM VERIFICATION						
ZERO OFFSET VERIFICATION						
DC CURRENT						
10 mA Range						
0.00000 mA	0.00000	-0.00200	0.00200	0.00003	0.00003	0.000007
100 mA Range						
0.0000 mA	0.0000	-0.0050	0.0050	0.0000	0.0000	0.00006
1 A Range						
0.000000 A	0.000000	-0.000100	0.000100	0.000001	0.000001	0.0000006
DC VOLTS						
100 mV Range						
0.0000 mV	0.0000	-0.0040	0.0040	0.0004	0.0004	0.00007
1 V Range						
0.000000 V	0.000000	-0.000007	0.000007	0.000001	0.000001	0.0000007
10 V Range						
0.00000 V	0.00000	-0.00005	0.00005	0.00000	0.00000	0.000007
100 V Range						
0.0000 V	0.0000	-0.0006	0.0006	0.0000	0.0000	0.00006
300 V Range						
0.000 V	0.000	-0.009	0.009	0.000	0.000	0.0006
2 WIRE □						
100 □ Range						
0.0000 Ohm	0.0000	-4.0040	4.0040	0.0626	0.0626	0.00007
1 k□ Range						
0.000000 kOhm	0.000000	-0.004010	0.004010	0.000065	0.000065	0.0000006
10 k□ Range						
0.00000 kOhm	0.00000	-0.00410	0.00410	0.00008	0.00008	0.000006
100 k□ Range						
0.0000 kOhm	0.0000	-0.0050	0.0050	0.0002	0.0002	0.00007
1 M□ Range						
0.000000 MOhm	0.000000	-0.000014	0.000014	0.000000	0.000000	0.0000007
10 M□ Range						

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ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY
Certificate No. ACT-1272

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
0.00000 MOhm	0.00000	-0.00010	0.00010	0.00000	0.00000	0.000007
100 M? Range						
0.0000 MOhm	0.0000	-0.0100	0.0100	0.0000	0.0000	0.00006
4 WIRE □						
100 □ Range						
0.0000 Ohm	0.0000	-0.0040	0.0040	-0.0023	-0.0023	0.00006
1 k□ Range						
0.000000 kOhm	0.000000	-0.000010	0.000010	0.000000	0.000000	0.0000006
10 k□ Range						
0.00000 kOhm	0.00000	-0.00010	0.00010	0.00000	0.00000	0.000007
100 k□ Range						
0.0000 kOhm	0.0000	-0.0010	0.0010	0.0000	0.0000	0.00007
1 M□ Range						
0.000000 MOhm	0.000000	-0.000010	0.000010	0.000000	0.000000	0.0000006
10 M□ Range						
0.00000 MOhm	0.00000	-0.00010	0.00010	0.00000	0.00000	0.000006
100 M□ Range						
0.0000 MOhm	0.0000	-0.0100	0.0100	0.0000	0.0000	0.00007
GAIN VERIFICATION						
DC VOLTS						
100 mV Range						
100.0000 mV	100.0000	99.9910	100.0090	100.0000	100.0000	0.00006
-100.0000 mV	-100.0000	-100.0090	-99.9910	-99.9987	-99.9987	0.00007
1 V Range						
1.000000 V	1.000000	0.999953	1.000047	0.999993	0.999993	0.0000007
-1.000000 V	-1.000000	-1.000047	-0.999953	-0.999989	-0.999989	0.0000007
10 V Range						
10.00000 V	10.00000	9.99960	10.00040	9.99994	9.99994	0.000006
-10.00000 V	-10.00000	-10.00040	-9.99960	-9.99992	-9.99992	0.000006
100 V Range						
100.0000 V	100.0000	99.9949	100.0051	99.9996	99.9996	0.00007
-100.0000 V	-100.0000	-100.0051	-99.9949	-99.9993	-99.9993	0.00007
300 V Range						
300.000 V	300.000	299.978	300.022	299.998	299.998	0.0006

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Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
2 WIRE Ω						
100 Ω Range						
100.0000 Ohm	100.0000	95.9860	104.0140	100.0067	100.0067	0.00007
1 kΩ Range						
1.000000 kOhm	1.000000	0.995890	1.004110	1.000032	1.000032	0.0000006
10 kΩ Range						
10.00000 kOhm	10.00000	9.99490	10.00510	10.00035	10.00035	0.000007
100 kΩ Range						
100.0000 kOhm	100.0000	99.9850	100.0150	100.0029	100.0029	0.00006
1 MΩ Range						
1.000000 MOhm	1.000000	0.999886	1.000114	1.000016	1.000016	0.0000006
10 MΩ Range						
10.00000 MOhm	10.00000	9.99590	10.00410	9.99768	9.99768	0.000006
100 MΩ Range						
100.0000 MOhm	100.0000	99.1900	100.8100	100.3688	100.3688	0.00007
4 WIRE Ω						
100 Ω Range						
100.0000 Ohm	100.0000	99.9860	100.0140	100.0039	100.0039	0.00006
1 kΩ Range						
1.000000 kOhm	1.000000	0.999890	1.000110	1.000030	1.000030	0.0000007
10 kΩ Range						
10.00000 kOhm	10.00000	9.99890	10.00110	10.00032	10.00032	0.000006
100 kΩ Range						
100.0000 kOhm	100.0000	99.9890	100.0110	100.0021	100.0021	0.00007
1 MΩ Range						
1.000000 MOhm	1.000000	0.999890	1.000110	0.999970	0.999970	0.0000007
10 MΩ Range						
10.00000 MOhm	10.00000	9.99590	10.00410	9.99595	9.99595	0.000006
100 MΩ Range						
100.0000 MOhm	100.0000	99.1900	100.8100	99.8275	99.8275	0.00006
DC CURRENT						
10 mA Range						
10.00000 mA	10.00000	9.99300	10.00700	9.99898	9.99898	0.000007
-10.00000 mA	-10.00000	-10.00700	-9.99300	-9.99887	-9.99887	0.000007

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ACCREDITED ISO IEC 17025 CALIBRATION AND TESTING LABORATORY
Certificate No. ACT-1272

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
100 mA Range						
100.0000 mA	100.0000	99.9450	100.0550	99.9882	99.9882	0.00006
-100.0000 mA	-100.0000	-100.0550	-99.9450	-99.9879	-99.9879	0.00006
1 A Range						
1.000000 A	1.000000	0.998900	1.001100	0.999534	0.999534	0.0000006
-1.000000 A	-1.000000	-1.001100	-0.998900	-0.999537	-0.999537	0.0000006
AC VOLTS						
100 mV Range						
10.0000 mV @ 1 kHz	10.0000	9.9540	10.0460	9.9997	9.9997	0.00006
100.0000 mV @ 1 kHz	100.0000	99.9000	100.1000	99.9912	99.9912	0.00006
100.0000 mV @ 50 kHz	100.0000	99.8300	100.1700	99.9383	99.9383	0.00006
1 V Range						
1.000000 V @ 20 Hz	1.000000	0.999000	1.001000	0.999803	0.999803	0.0000006
1.000000 V @ 1 kHz	1.000000	0.999000	1.001000	0.999950	0.999950	0.0000006
1.000000 V @ 20 kHz	1.000000	0.999000	1.001000	0.999888	0.999888	0.0000006
1.000000 V @ 50 kHz	1.000000	0.998300	1.001700	0.999504	0.999504	0.0000007
1.000000 V @ 100 kHz	1.000000	0.993200	1.006800	0.998811	0.998811	0.0000006
1.000000 V @ 200 kHz	1.000000	0.955000	1.045000	0.999068	0.999068	0.0000006
1.000000 V @ 250 kHz	1.000000	0.955000	1.045000	0.999202	0.999202	0.0000007
1.000000 V @ 300 kHz	1.000000	0.955000	1.045000	0.998797	0.998797	0.0000006
10 V Range						
0.10000 V @ 1 kHz	0.10000	0.08594	0.11406	0.10086	0.10086	0.000006
1.00000 V @ 1 kHz	1.00000	0.99540	1.00460	0.99992	0.99992	0.000006
10.00000 V @ 10 Hz	10.00000	9.99000	10.01000	9.99743	9.99743	0.000007
10.00000 V @ 1 kHz	10.00000	9.99000	10.01000	9.99855	9.99855	0.000006
10.00000 V @ 50 kHz	10.00000	9.98300	10.01700	9.99499	9.99499	0.000006
100 V Range						
100.0000 V @ 1 kHz	100.0000	99.9000	100.1000	99.9653	99.9653	0.00006
100.0000 V @ 50 kHz	100.0000	99.8300	100.1700	99.8943	99.8943	0.00006

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Certificate No. ACT-1272

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
300 V Range						
300.000 V @ 1 kHz	300.000	299.580	300.420	299.884	299.884	0.0006
200.000 V @ 50 kHz	200.000	199.400	200.600	199.750	199.750	0.0007
AC CURRENT						
10 mA Range						
10.00000 mA @ 1 kHz	10.00000	9.98600	10.01400	9.99766	9.99766	0.000007
100 mA Range						
100.0000 mA @ 1 kHz	100.0000	99.4000	100.6000	99.9484	99.9484	0.00007
1 A Range						
0.010000 A @ 1 kHz	0.010000	0.008590	0.011410	0.009960	0.009960	0.0000007
1.000000 A @ 1 kHz	1.000000	0.998600	1.001400	0.999502	0.999502	0.0000006
FREQUENCY						
100 Hz Range						
100.0000 Hz	100.0000	99.9000	100.1000	100.0056	100.0056	0.00007
100 kHz Range						
100.0000 kHz	100.0000	99.9900	100.0100	100.0001	100.0001	0.00007

Appendix K - Certificates of Calibration
(Appendix pages K1 to K26 identical to pages E1 to E26)

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CERTIFICATE OF CALIBRATION

ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY
Certificate No. ACT-1272

Certification Number CK198-39504-466

For Eaton Corporation - ICD
W126 N7250 Flint Drive
Menomonee Falls, WI 53051

Purchase Order #	4044-671109
Test Instrument	Multimeter Digital Multimeter
Make	Fluke
Model	179
Serial Number	77840008
Identification	EM4437
Customer Location	ICD
Condition Received	In Tolerance
Condition Returned	In Tolerance
Calibrated By	Alex Paulsen
Technical Review By	Tim Bending
Calibration Location	FVM
Calibration Conditions	68.3°F, 20.2°C, 56.2%RH
Calibration Date	07/16/2020
Recalibration Due	07/16/2021

Procedures Followed
FVE-000 rev. 2
FVE-001 rev. 2

Form Revision 6: 02/04/2012

Standards Used

Instrument	Serial Number	Trace Number	Next Cal
FVS-275A	RY11838	CJ191-70508-513	07/28/2020
FVS-737	4542903	CK041-57440-531	02/28/2021

Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. (This is considered "shared responsibility.") Uncertainties expressed in base units.

All instruments have been calibrated against standards traceable to NIST. Calibration was completed in accordance with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 and ANSI/NCSL Z540.3-2006. Other standards listed upon request.

Calibration Results

* denotes "Out of Tolerance"

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
AC VOLTS						
600 mV Range						
300.0 mV @ 45 Hz	300.0	296.7	303.3	299.2	299.2	0.07
6 V Range						
5.000 V @ 500 Hz	5.000	4.947	5.053	4.987	4.987	0.0007
5.000 V @ 1 kHz	5.000	4.897	5.103	4.949	4.949	0.0007
60 V Range						
50.00 V @ 45 Hz	50.00	49.47	50.53	49.98	49.98	0.007
50.00 V @ 1 kHz	50.00	48.97	51.03	50.02	50.02	0.007
600 V Range						
300.0 V @ 45 Hz	300.0	296.7	303.3	299.9	299.9	0.07
500.0 V @ 500 Hz	500.0	494.7	505.3	500.5	500.5	0.06
500.0 V @ 1 kHz	500.0	489.7	510.3	500.5	500.5	0.06
1000 V Range						
1000 V @ 45 Hz	1000	987	1013	1002	1002	0.7

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CERTIFICATE OF CALIBRATION

ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY

Certificate No. ACT-1272

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
AC VOLTS						
FREQUENCY						
45.00 Hz @ 1 V	45.00	44.95	45.06	45.01	45.01	0.007
50.00 kHz @ 5 V	50.00	49.94	50.06	50.00	50.00	0.006
DC VOLTAGE						
6 V Range						
5.000 V	5.000	4.994	5.007	4.997	4.997	0.0006
600 V Range						
300.0 V	300.0	299.5	300.5	299.8	299.8	0.06
1000 V Range						
1000 V	1000	997	1004	999	999	0.6
-1000 V	-1000	-1004	-997	-1000	-1000	0.7
DC VOLTS						
FREQUENCY						
45.00 Hz @ 3 V	45.00	44.95	45.06	45.01	45.01	0.007
50.00 kHz @ 30 V	50.00	49.94	50.06	50.00	50.00	0.007
DC MILLIVOLTS						
30.0 mV	30.0	29.8	30.2	30.0	30.0	0.06
-300.0 mV	-300.0	-300.5	-299.5	-299.9	-299.9	0.06
600.0 mV	600.0	599.3	600.7	599.7	599.7	0.07
TEMPERATURE						
0.0 °C	0.0	-1.0	1.0	1.0	1.0	0.06
-40.0 °C	-40.0	-41.4	-38.6	-39.0	-39.0	0.07
400.0 °C	400.0	395.0	405.0	400.9	400.9	0.06
OHMS						
600 Ohm Range						
19.0 Ohm	19.0	18.6	19.4	19.3	19.3	0.07
50 MOhm Range						
19.00 MOhm	19.00	18.68	19.32	19.00	19.00	0.006
CAPACITANCE						
1000 nF Range						
900 nF	900	887	913	899	899	0.6
CONTINUITY						
0 Ohms: Beeper On				Pass	Pass	
190 Ohms: Beeper Off				Pass	Pass	
DIODE TEST						

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CERTIFICATE OF CALIBRATION

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Certificate No. ACT-1272

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
2.000 V	2.000	1.978	2.022	2.000	2.000	0.0007
AC MILLIAMPS						
60 mA Range						
3.00 mA @ 45 Hz	3.00	2.92	3.08	3.00	3.00	0.007
50.00 mA @ 1 kHz	50.00	49.22	50.78	50.06	50.06	0.006
400 mA Range						
400.0 mA @ 1 kHz	400.0	393.7	406.3	400.4	400.4	0.07
AC AMPS						
6 A Range						
4.000 A @ 45 Hz	4.000	3.937	4.063	4.005	4.005	0.0007
10A Range						
9.00 A @ 1 kHz	9.00	8.84	9.16	9.04	9.04	0.007
DC MILLIAMPS						
60 mA Range						
3.00 mA	3.00	2.94	3.06	3.00	3.00	0.006
50.00 mA	50.00	49.47	50.53	49.92	49.92	0.007
400 mA Range						
-400.0 mA	-400.0	-404.3	-395.7	-399.8	-399.8	0.07
DC AMPS						
6 A Range						
4.000 A	4.000	3.957	4.043	3.999	3.999	0.0007
10 A Range						
-9.00 A	-9.00	-9.12	-8.88	-9.01	-9.01	0.006

Appendix K - Certificates of Calibration
(Appendix pages K1 to K26 identical to pages E1 to E26)

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CERTIFICATE OF CALIBRATION

ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY
Certificate No. ACT-1272

Certification Number CK198-38060-466

For Eaton Corporation - ICD
W126 N7250 Flint Drive
Menomonee Falls, WI 53051

Purchase Order #	4044-671109
Test Instrument	Multimeter Digital Multimeter
Make	Fluke
Model	175
Serial Number	13700492
Identification	EM7014
Customer Location	ICD
Condition Received	In Tolerance
Condition Returned	In Tolerance
Calibrated By	Alex Paulsen
Technical Review By	Tim Bending
Calibration Location	FVM
Calibration Conditions	68.2°F, 20.1°C, 56.6%RH
Calibration Date	07/16/2020
Recalibration Due	07/16/2021

Procedures Followed
FVE-000 rev. 2
FVE-001 rev. 2

Form Revision 6: 02/04/2012

Standards Used

Instrument	Serial Number	Trace Number	Next Cal
FVS-275A	RY11838	CJ191-70508-513	07/28/2020
FVS-737	4542903	CK041-57440-531	02/28/2021

Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. (This is considered "shared responsibility.") Uncertainties expressed in base units.

All instruments have been calibrated against standards traceable to NIST. Calibration was completed in accordance with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 and ANSI/NCSL Z540.3-2006. Other standards listed upon request.

Calibration Results

* denotes "Out of Tolerance"

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
AC VOLTS						
600 mV Range						
300.0 mV @ 45 Hz	300.0	296.7	303.3	299.9	299.9	0.07
6 V Range						
5.000 V @ 500 Hz	5.000	4.947	5.053	4.994	4.994	0.0007
5.000 V @ 1 kHz	5.000	4.897	5.103	4.955	4.955	0.0006
60 V Range						
50.00 V @ 45 Hz	50.00	49.47	50.53	49.94	49.94	0.007
50.00 V @ 1 kHz	50.00	48.97	51.03	50.06	50.06	0.006
600 V Range						
300.0 V @ 45 Hz	300.0	296.7	303.3	299.8	299.8	0.07
500.0 V @ 500 Hz	500.0	494.7	505.3	500.4	500.4	0.07
500.0 V @ 1 kHz	500.0	489.7	510.3	500.4	500.4	0.06
1000 V Range						
1000 V @ 45 Hz	1000	987	1013	996	996	0.6

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CERTIFICATE OF CALIBRATION

ilac-MRA ANAB ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY
Certificate No. ACT-1272

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
AC VOLTS						
FREQUENCY						
45.00 Hz @ 1 V	45.00	44.95	45.06	45.00	45.00	0.007
50.00 kHz @ 5 V	50.00	49.94	50.06	50.00	50.00	0.007
DC VOLTAGE						
6 V Range						
5.000 V	5.000	4.990	5.010	5.000	5.000	0.0007
600 V Range						
300.0 V	300.0	299.4	300.6	300.0	300.0	0.06
1000 V Range						
1000 V	1000	997	1004	1000	1000	0.7
-1000 V	-1000	-1004	-997	-1000	-1000	0.7
DC VOLTS						
FREQUENCY						
45.00 Hz @ 3 V	45.00	44.95	45.06	45.00	45.00	0.007
50.00 kHz @ 30 V	50.00	49.94	50.06	50.00	50.00	0.007
DC MILLIVOLTS						
30.0 mV	30.0	29.8	30.2	30.0	30.0	0.07
-300.0 mV	-300.0	-300.6	-299.4	-299.9	-299.9	0.06
600.0 mV	600.0	598.9	601.1	599.9	599.9	0.06
OHMS						
600 Ohm Range						
19.0 Ohm	19.0	18.6	19.4	19.0	19.0	0.07
50 MOhm Range						
19.00 MOhm	19.00	18.68	19.32	18.99	18.99	0.006
CAPACITANCE						
1000 nF Range						
900 nF	900	887	913	900	900	0.7
CONTINUITY						
0 Ohms: Beeper On				Pass	Pass	
190 Ohms: Beeper Off				Pass	Pass	
DIODE TEST						
2.000 V	2.000	1.978	2.022	2.001	2.001	0.0006
AC MILLIAMPS						
60 mA Range						

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CERTIFICATE OF CALIBRATION

ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY

Certificate No. ACT-1272

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
3.00 mA @ 45 Hz	3.00	2.92	3.08	3.01	3.01	0.007
50.00 mA @ 1 kHz	50.00	49.22	50.78	49.96	49.96	0.007
400 mA Range						
400.0 mA @ 1 kHz	400.0	393.7	406.3	399.4	399.4	0.06
AC AMPS						
6 A Range						
4.000 A @ 45 Hz	4.000	3.937	4.063	3.997	3.997	0.0007
10A Range						
9.00 A @ 1 kHz	9.00	8.84	9.16	9.00	9.00	0.007
DC MILLIAMPS						
60 mA Range						
3.00 mA	3.00	2.94	3.06	3.02	3.02	0.006
50.00 mA	50.00	49.47	50.53	49.99	49.99	0.006
400 mA Range						
-400.0 mA	-400.0	-404.3	-395.7	-400.0	-400.0	0.07
DC AMPS						
6 A Range						
4.000 A	4.000	3.957	4.043	3.999	3.999	0.0007
10 A Range						
-9.00 A	-9.00	-9.12	-8.88	-9.00	-9.00	0.007

Appendix K - Certificates of Calibration
(Appendix pages K1 to K26 identical to pages E1 to E26)

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CERTIFICATE OF CALIBRATION

ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY
Certificate No. ACT-1272

Certification Number CK198-38779-466

For Eaton Corporation - ICD
W126 N7250 Flint Drive
Menomonee Falls, WI 53051

Purchase Order #	4044-671109
Test Instrument	Multimeter Digital Multimeter
Make	Fluke
Model	179
Serial Number	14370601
Identification	EM7024
Customer Location	ICD
Condition Received	In Tolerance
Condition Returned	In Tolerance
Calibrated By	Alex Paulsen
Technical Review By	Tim Bending
Calibration Location	FVM
Calibration Conditions	68.2°F, 20.1°C, 56.6%RH
Calibration Date	07/16/2020
Recalibration Due	07/16/2021

Procedures Followed
FVE-000 rev. 2
FVE-001 rev. 2

Form Revision 6: 02/04/2012

Standards Used

Instrument	Serial Number	Trace Number	Next Cal
FVS-275A	RY11838	CJ191-70508-513	07/28/2020
FVS-737	4542903	CK041-57440-531	02/28/2021

Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. (This is considered "shared responsibility.") Uncertainties expressed in nominal units.

All instruments have been calibrated against standards traceable to NIST. Calibration was completed in accordance with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 and ANSI/NCSL Z540.3-2006. Other standards listed upon request.

Calibration Results

* denotes "Out of Tolerance"

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
AC VOLTS						
600 mV Range						
300.0 mV @ 45 Hz	300.0	296.7	303.3	300.0	300.0	0.06
6 V Range						
5.000 V @ 500 Hz	5.000	4.947	5.053	4.997	4.997	0.0006
5.000 V @ 1 kHz	5.000	4.897	5.103	4.961	4.961	0.0006
60 V Range						
50.00 V @ 45 Hz	50.00	49.47	50.53	49.97	49.97	0.006
50.00 V @ 1 kHz	50.00	48.97	51.03	50.10	50.10	0.007
600 V Range						
300.0 V @ 45 Hz	300.0	296.7	303.3	300.0	300.0	0.07
500.0 V @ 500 Hz	500.0	494.7	505.3	500.9	500.9	0.06
500.0 V @ 1 kHz	500.0	489.7	510.3	500.8	500.8	0.06
1000 V Range						
1000 V @ 45 Hz	1000	987	1013	997	997	0.7

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CERTIFICATE OF CALIBRATION

ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY
Certificate No. ACT-1272

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
AC VOLTS						
FREQUENCY						
45.00 Hz @ 1 V	45.00	44.95	45.06	45.00	45.00	0.007
50.00 kHz @ 5 V	50.00	49.94	50.06	50.00	50.00	0.006
DC VOLTAGE						
6 V Range						
5.000 V	5.000	4.994	5.007	5.000	5.000	0.0006
600 V Range						
300.0 V	300.0	299.5	300.5	299.9	299.9	0.06
1000 V Range						
1000 V	1000	997	1004	1000	1000	0.7
-1000 V	-1000	-1004	-997	-1000	-1000	0.7
DC VOLTS						
FREQUENCY						
45.00 Hz @ 3 V	45.00	44.95	45.06	45.00	45.00	0.007
50.00 kHz @ 30 V	50.00	49.94	50.06	50.00	50.00	0.006
DC MILLIVOLTS						
30.0 mV	30.0	29.8	30.2	30.0	30.0	0.06
-300.0 mV	-300.0	-300.5	-299.5	-299.9	-299.9	0.06
600.0 mV	600.0	599.3	600.7	599.8	599.8	0.06
TEMPERATURE						
0.0 °C	0.0	-1.0	1.0	0.5	0.5	0.06
-40.0 °C	-40.0	-41.4	-38.6	-39.3	-39.3	0.06
400.0 °C	400.0	395.0	405.0	400.4	400.4	0.06
OHMS						
600 Ohm Range						
19.0 Ohm	19.0	18.6	19.4	19.0	19.0	0.06
50 MOhm Range						
19.00 MOhm	19.00	18.68	19.32	18.98	18.98	0.006
CAPACITANCE						
1000 nF Range						
900 nF	900	887	913	900	900	0.6
CONTINUITY						
0 Ohms: Beeper On				Pass	Pass	
190 Ohms: Beeper Off				Pass	Pass	
DIODE TEST						

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CERTIFICATE OF CALIBRATION

ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY
Certificate No. ACT-1272

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
2.000 V	2.000	1.978	2.022	2.001	2.001	0.0007
AC MILLIAMPS						
60 mA Range						
3.00 mA @ 45 Hz	3.00	2.92	3.08	3.02	3.02	0.006
50.00 mA @ 1 kHz	50.00	49.22	50.78	50.03	50.03	0.006
400 mA Range						
400.0 mA @ 1 kHz	400.0	393.7	406.3	399.9	399.9	0.06
AC AMPS						
6 A Range						
4.000 A @ 45 Hz	4.000	3.937	4.063	4.004	4.004	0.0006
10A Range						
9.00 A @ 1 kHz	9.00	8.84	9.16	9.01	9.01	0.007
DC MILLIAMPS						
60 mA Range						
3.00 mA	3.00	2.94	3.06	3.01	3.01	0.007
50.00 mA	50.00	49.47	50.53	49.99	49.99	0.007
400 mA Range						
-400.0 mA	-400.0	-404.3	-395.7	-399.9	-399.9	0.06
DC AMPS						
6 A Range						
4.000 A	4.000	3.957	4.043	3.998	3.998	0.0006
10 A Range						
-9.00 A	-9.00	-9.12	-8.88	-9.00	-9.00	0.007

Appendix K - Certificates of Calibration
(Appendix pages K1 to K26 identical to pages E1 to E26)

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CERTIFICATE OF CALIBRATION

ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY
Certificate No. ACT-1272

Certification Number CK198-41226-466

For Eaton Corporation - ICD
W126 N7250 Flint Drive
Menomonee Falls, WI 53051

Purchase Order #	4044-671109
Test Instrument	Clamp Meter
Make	AEMC
Model	SR759
Serial Number	224137GKDV
Identification	EM6996
Customer Location	ICD
Condition Received	In Tolerance
Condition Returned	In Tolerance
Calibrated By	Alex Paulsen
Technical Review By	Tim Bending
Calibration Location	FVM
Calibration Conditions	67.8°F, 19.9°C, 56.3%RH
Calibration Date	07/16/2020
Recalibration Due	07/16/2021

Procedures Followed
FVE-007 rev. 2

Form Revision 6: 02/04/2012

Standards Used

Instrument	Serial Number	Trace Number	Next Cal
FVS-275A	RY11838	CJ191-70508-513	07/28/2020
FVS-546	24560221	CK093-41519-573	04/30/2021
FVS-737	4542903	CK041-57440-531	02/28/2021

Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. (This is considered "shared responsibility.") Uncertainties expressed in nominal units.

All instruments have been calibrated against standards traceable to NIST. Calibration was completed in accordance with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 and ANSI/NCSL Z540.3-2006. Other standards listed upon request.

Calibration Results

* denotes "Out of Tolerance"

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
1A Range; 1000mV/A @60 Hz	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)
10 mA	10.0	8.7	11.3	10.1	10.1	0.07
100 mA	100.0	96.0	104.0	101.3	101.3	0.06
500 mA	500.0	495.5	504.5	504.5	504.5	0.06
	(V AC)	(V AC)	(V AC)	(V AC)	(V AC)	(V AC)
1 A	1.000	0.992	1.008	1.008	1.008	0.0006
10A Range; 100mV/A @60 Hz	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)
100 mA	10.0	9.7	10.3	10.0	10.0	0.07
1 A	100.0	99.3	100.7	100.4	100.4	0.07
5 A	500.0	497.5	502.5	501.8	501.8	0.06
	(V AC)	(V AC)	(V AC)	(V AC)	(V AC)	(V AC)
10 A	1.000	0.995	1.005	1.004	1.004	0.0007
100A Range; 10mV/A @60 Hz	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)
1 A	10.0	9.7	10.3	10.0	10.0	0.07
10 A	100.0	99.3	100.7	100.1	100.1	0.06

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CERTIFICATE OF CALIBRATION

ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY
Certificate No. ACT-1272

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
50 A	500.0 (V AC)	498.5 (V AC)	501.5 (V AC)	500.3 (V AC)	500.3 (V AC)	0.06 (V AC)
100 A	1.000	0.998	1.002	1.001	1.001	0.0006
1000A Range; 1mV/A @60 Hz	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)
10 A	10.0	9.7	10.3	10.0	10.0	0.06
100 A	100.0	99.3	100.7	100.1	100.1	0.07
500 A	500.0	499.0	501.0	500.5	500.5	0.07
900 A	900.0	898.0	902.0	901.2	901.2	0.07

Appendix K - Certificates of Calibration
(Appendix pages K1 to K26 identical to pages E1 to E26)

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CERTIFICATE OF CALIBRATION

ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY
Certificate No. ACT-1272

Certification Number CK198-40179-466

For Eaton Corporation - ICD
W126 N7250 Flint Drive
Menomonee Falls, WI 53051

Purchase Order #	4044-671109
Test Instrument	Clamp Meter
Make	AEMC
Model	SR759
Serial Number	224139GKDV
Identification	EM6997
Customer Location	ICD
Condition Received	In Tolerance
Condition Returned	In Tolerance
Calibrated By	Alex Paulsen
Technical Review By	Tim Bending
Calibration Location	FVM
Calibration Conditions	67.8°F, 19.9°C, 56.3%RH
Calibration Date	07/16/2020
Recalibration Due	07/16/2021

Procedures Followed
FVE-007 rev. 2

Form Revision 6: 02/04/2012

Standards Used

Instrument	Serial Number	Trace Number	Next Cal
FVS-275A	RY11838	CJ191-70508-513	07/28/2020
FVS-546	24560221	CK093-41519-573	04/30/2021
FVS-737	4542903	CK041-57440-531	02/28/2021

Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. (This is considered "shared responsibility.") Uncertainties expressed in nominal units.

All instruments have been calibrated against standards traceable to NIST. Calibration was completed in accordance with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 and ANSI/NCSL Z540.3-2006. Other standards listed upon request.

Calibration Results

* denotes "Out of Tolerance"

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
1A Range; 1000mV/A @60 Hz	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)
10 mA	10.0	8.7	11.3	10.1	10.1	0.06
100 mA	100.0	96.0	104.0	101.1	101.1	0.06
500 mA	500.0	495.5	504.5	504.5	504.5	0.06
	(V AC)	(V AC)	(V AC)	(V AC)	(V AC)	(V AC)
1 A	1.000	0.992	1.008	1.008	1.008	0.0006
10A Range; 100mV/A @60 Hz	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)
100 mA	10.0	9.7	10.3	10.0	10.0	0.07
1 A	100.0	99.3	100.7	100.2	100.2	0.06
5 A	500.0	497.5	502.5	500.9	500.9	0.06
	(V AC)	(V AC)	(V AC)	(V AC)	(V AC)	(V AC)
10 A	1.000	0.995	1.005	1.002	1.002	0.0006
100A Range; 10mV/A @60 Hz	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)
1 A	10.0	9.7	10.3	10.0	10.0	0.06
10 A	100.0	99.3	100.7	100.1	100.1	0.07

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CERTIFICATE OF CALIBRATION

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Certificate No. ACT-1272

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
50 A	500.0 (V AC)	498.5 (V AC)	501.5 (V AC)	500.1 (V AC)	500.1 (V AC)	0.06 (V AC)
100 A	1.000	0.998	1.002	1.001	1.001	0.0006
1000A Range; 1mV/A @60 Hz	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)
10 A	10.0	9.7	10.3	10.0	10.0	0.07
100 A	100.0	99.3	100.7	100.1	100.1	0.06
500 A	500.0	499.0	501.0	500.3	500.3	0.06
900 A	900.0	898.0	902.0	901.4	901.4	0.06

Appendix K - Certificates of Calibration
(Appendix pages K1 to K26 identical to pages E1 to E26)

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CERTIFICATE OF CALIBRATION

ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY
Certificate No. ACT-1272

Certification Number CK198-41583-466

For Eaton Corporation - ICD
W126 N7250 Flint Drive
Menomonee Falls, WI 53051

Purchase Order #	4044-671109
Test Instrument	Clamp Meter
Make	AEMC
Model	SR759
Serial Number	239584HKDV
Identification	EM8032
Customer Location	ICD
Condition Received	In Tolerance
Condition Returned	In Tolerance
Calibrated By	Alex Paulsen
Technical Review By	Tim Bending
Calibration Location	FVM
Calibration Conditions	67.8°F, 19.9°C, 56.3%RH
Calibration Date	07/16/2020
Recalibration Due	07/16/2021

Procedures Followed
FVE-007 rev. 2

Form Revision 6: 02/04/2012

Standards Used

Instrument	Serial Number	Trace Number	Next Cal
FVS-275A	RY11838	CJ191-70508-513	07/28/2020
FVS-546	24560221	CK093-41519-573	04/30/2021
FVS-737	4542903	CK041-57440-531	02/28/2021

Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. (This is considered "shared responsibility.") Uncertainties expressed in nominal units.

All instruments have been calibrated against standards traceable to NIST. Calibration was completed in accordance with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 and ANSI/NCSL Z540.3-2006. Other standards listed upon request.

Calibration Results

* denotes "Out of Tolerance"

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
1A Range; 1000mV/A @60 Hz	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)
10 mA	10.0	8.7	11.3	10.2	10.2	0.07
100 mA	100.0	96.0	104.0	101.1	101.1	0.07
500 mA	500.0	495.5	504.5	504.3	504.3	0.06
	(V AC)	(V AC)	(V AC)	(V AC)	(V AC)	(V AC)
1 A	1.000	0.992	1.008	1.007	1.007	0.0007
10A Range; 100mV/A @60 Hz	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)
100 mA	10.0	9.7	10.3	10.0	10.0	0.07
1 A	100.0	99.3	100.7	100.2	100.2	0.07
5 A	500.0	497.5	502.5	500.7	500.7	0.06
	(V AC)	(V AC)	(V AC)	(V AC)	(V AC)	(V AC)
10 A	1.000	0.995	1.005	1.002	1.002	0.0006
100A Range; 10mV/A @60 Hz	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)
1 A	10.0	9.7	10.3	10.0	10.0	0.07
10 A	100.0	99.3	100.7	100.0	100.0	0.07

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CERTIFICATE OF CALIBRATION

ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY
Certificate No. ACT-1272

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
50 A	500.0 (V AC)	498.5 (V AC)	501.5 (V AC)	500.0 (V AC)	500.0 (V AC)	0.07 (V AC)
100 A	1.000	0.998	1.002	1.000	1.000	0.0007
1000A Range; 1mV/A @60 Hz	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)	(mV AC)
10 A	10.0	9.7	10.3	10.0	10.0	0.07
100 A	100.0	99.3	100.7	100.0	100.0	0.06
500 A	500.0	499.0	501.0	500.3	500.3	0.07
900 A	900.0	898.0	902.0	900.6	900.6	0.07

Appendix K - Certificates of Calibration
(Appendix pages K1 to K26 identical to pages E1 to E26)

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CERTIFICATE OF CALIBRATION

ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY
Certificate No. ACT-1272

Certification Number CK196-72143-379

For Eaton Corporation - ICD
W126 N7250 Flint Drive
Menomonee Falls, WI 53051

Purchase Order #	4044-671109
Test Instrument	Torque Wrench
Make	CDI
Model	1502LDIN (3%)
Serial Number	0312910937
Identification	EM8363
Customer Location	ICD
Condition Received	In Tolerance
Condition Returned	In Tolerance
Calibrated By	Jim Peterson
Technical Review By	Kevin Dehne
Calibration Location	FVM
Calibration Conditions	69.0°F, 20.6°C, 54.2%RH
Calibration Date	07/14/2020
Recalibration Due	07/14/2021

Procedures Followed
FVE-014 rev. 2

Form Revision 6: 02/04/2012

Standards Used

Instrument	Serial Number	Trace Number	Next Cal
FVS-093	03111	CK191-31886-628	10/31/2020
FVS-275A	RY11838	CJ191-70508-513	07/28/2020

Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. (This is considered "shared responsibility.") Uncertainties expressed in nominal units.

All instruments have been calibrated against standards traceable to NIST. Calibration was completed in accordance with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 and ANSI/NCSL Z540.3-2006. Other standards listed upon request.

Calibration Results

* denotes "Out of Tolerance"

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
Clockwise	(in lb)	(in lb)	(in lb)	(in lb)	(in lb)	(in lb)
	30.00	29.10	30.90	29.89	29.89	0.091
	90.00	87.30	92.70	90.23	90.23	0.271
	150.00	145.50	154.50	152.00	152.00	0.450
Counter Clockwise	(in lb)	(in lb)	(in lb)	(in lb)	(in lb)	(in lb)
	30.00	29.10	30.90	30.31	30.31	0.091
	90.00	87.30	92.70	89.53	89.53	0.271
	150.00	145.50	154.50	148.58	148.58	0.450

Appendix K - Certificates of Calibration
(Appendix pages K1 to K26 identical to pages E1 to E26)

Fox Valley Metrology
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CERTIFICATE OF CALIBRATION

ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY
Certificate No. ACT-1272

Certification Number CK198-49542-348

For Eaton Corporation - ICD
W126 N7250 Flint Drive
Menomonee Falls, WI 53051

Purchase Order #	4044-671109
Test Instrument	Tape Measure
Make	Stanley
Model	30-824
Serial Number	
Identification	EM6927
Customer Location	ICD Tony
Condition Received	In Tolerance
Condition Returned	In Tolerance
Calibrated By	Matthew Roughen
Technical Review By	Laura Fuhrmann
Calibration Location	FVM
Calibration Conditions	69.5°F, 20.8°C, 34.8%RH
Calibration Date	07/16/2020
Recalibration Due	07/16/2021

Procedures Followed
FVM-042 rev. 1

Form Revision 6: 02/04/2012

Standards Used

Instrument	Serial Number	Trace Number	Next Cal
FVM-044	C404R	CH121-20770-384	05/28/2022
FVM-079A	RY11924	CJ191-72229-513	07/28/2020

Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. (This is considered "shared responsibility.") Uncertainties expressed in nominal units.

All instruments have been calibrated against standards traceable to NIST. Calibration was completed in accordance with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 and ANSI/NCSL Z540.3-2006. Other standards listed upon request.

Calibration Results

* denotes "Out of Tolerance"

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
Length	(in)	(in)	(in)	(in)	(in)	
	12.000	11.969	12.031	11.995	11.995	0.0006
	24.000	23.938	24.062	23.995	23.995	0.0007
	48.000	47.938	48.062	47.995	47.995	0.0007
	72.000	71.938	72.062	71.995	71.995	0.0007
	144.000	143.938	144.062	143.995	143.995	0.0006
	216.000	215.938	216.062	215.995	215.995	0.0006
	312.000	311.938	312.062	311.995	311.995	0.0007
Length	(cm)	(cm)	(cm)	(cm)	(cm)	(cm)
	500.00	499.00	501.00	499.87	499.87	0.007
	1000.00	999.00	1001.00	999.87	999.87	0.006
	5000.00	4999.00	5001.00	4999.87	4999.87	0.008
	8000.00	7999.00	8001.00	7999.87	7999.87	0.012

Appendix K - Certificates of Calibration
(Appendix pages K1 to K26 identical to pages E1 to E26)

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CERTIFICATE OF CALIBRATION

ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY
Certificate No. ACT-1272

Certification Number CK283-37262-427

For Eaton Corporation - ICD
W126 N7250 Flint Drive
Menomonee Falls, WI 53051

Purchase Order #	
Test Instrument	Weights
Make	Standard Weight
Model	Standard Weight
Serial Number	5070
Identification	EM3031-8
Customer Location	ICD
Condition Received	In Tolerance
Condition Returned	In Tolerance
Calibrated By	Michael Frank
Technical Review By	Tim Bending
Calibration Location	FVM
Calibration Conditions	68.6°F, 20.3°C, 41.3%RH
Calibration Date	10/09/2020
Recalibration Due	10/09/2021

Procedures Followed
FVE-059 rev. 1

Form Revision 6: 02/04/2012

Standards Used

Instrument	Serial Number	Trace Number	Next Cal
FVS-019P	N/A	CK188-74019-614	06/30/2021
FVS-275A	RY11838	CK202-61167-614	07/31/2021
FVS-792	14737316	CK100-21449-466	04/30/2021

Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. (This is considered “shared responsibility.”) Uncertainties expressed in nominal units.

All instruments have been calibrated against standards traceable to NIST. Calibration was completed in accordance with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 and ANSI/NCSL Z540.3-2006. Other standards listed upon request.

Calibration Results

* denotes "Out of Tolerance"

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
ASTM E617 Class 7 Conventional Mass Correction				FVS-792	FVS-792	
10 lb	(g) 0.0	(g) -1.3	(g) 1.3	(g) -0.4	(g) -0.4	(g) 0.06

Comments
Test Weights Conventional Mass Correction Reference = C0000-WGHTS-FVM

Appendix K - Certificates of Calibration
(Appendix pages K1 to K26 identical to pages E1 to E26)

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CERTIFICATE OF CALIBRATION

ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY
Certificate No. ACT-1272

Certification Number CK283-36927-427

For Eaton Corporation - ICD
W126 N7250 Flint Drive
Menomonee Falls, WI 53051

Purchase Order #	
Test Instrument	Weights
Make	Standard Weight
Model	Standard Weight
Serial Number	C1538
Identification	EM3932-7
Customer Location	
Condition Received	In Tolerance
Condition Returned	In Tolerance
Calibrated By	Michael Frank
Technical Review By	Tim Bending
Calibration Location	FVM
Calibration Conditions	68.6°F, 20.3°C, 41.3%RH
Calibration Date	10/09/2020
Recalibration Due	10/09/2021

Procedures Followed
FVE-059 rev. 1

Form Revision 6: 02/04/2012

Standards Used

Instrument	Serial Number	Trace Number	Next Cal
FVS-019P	N/A	CK188-74019-614	06/30/2021
FVS-275A	RY11838	CK202-61167-614	07/31/2021
FVS-792	14737316	CK100-21449-466	04/30/2021

Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. (This is considered “shared responsibility.”) Uncertainties expressed in nominal units.

All instruments have been calibrated against standards traceable to NIST. Calibration was completed in accordance with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 and ANSI/NCSL Z540.3-2006. Other standards listed upon request.

Calibration Results

* denotes "Out of Tolerance"

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
ASTM E617 Class 7 Conventional Mass Correction				FVS-792	FVS-792	
5 lb	(g) 0.0	(g) -0.8	(g) 0.8	(g) -0.1	(g) -0.1	(g) 0.06

Comments
Test Weights Conventional Mass Correction Reference = C0000-WGHTS-FVM

Appendix K - Certificates of Calibration
(Appendix pages K1 to K26 identical to pages E1 to E26)

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CERTIFICATE OF CALIBRATION

ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY
Certificate No. ACT-1272

Certification Number CK283-36604-427

For Eaton Corporation - ICD
W126 N7250 Flint Drive
Menomonee Falls, WI 53051

Purchase Order #	
Test Instrument	Weights
Make	Standard Weight
Model	Standard Weight
Serial Number	62631
Identification	EM6402
Customer Location	ICD
Condition Received	In Tolerance
Condition Returned	In Tolerance
Calibrated By	Michael Frank
Technical Review By	Tim Bending
Calibration Location	FVM
Calibration Conditions	68.6°F, 20.3°C, 41.3%RH
Calibration Date	10/09/2020
Recalibration Due	10/09/2021

Procedures Followed
FVE-059 rev. 1

Form Revision 6: 02/04/2012

Standards Used

Instrument	Serial Number	Trace Number	Next Cal
FVS-019P	N/A	CK188-74019-614	06/30/2021
FVS-275A	RY11838	CK202-61167-614	07/31/2021
FVS-792	14737316	CK100-21449-466	04/30/2021

Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. (This is considered “shared responsibility.”) Uncertainties expressed in nominal units.

All instruments have been calibrated against standards traceable to NIST. Calibration was completed in accordance with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 and ANSI/NCSL Z540.3-2006. Other standards listed upon request.

Calibration Results

* denotes "Out of Tolerance"

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
ASTM E617 Class 7 Conventional Mass Correction				FVS-792	FVS-792	
2 lb	(g) 0.0	(g) -0.4	(g) 0.4	(g) -0.1	(g) -0.1	(g) 0.07

Comments
Test Weights Conventional Mass Correction Reference = C0000-WGHTS-FVM

Appendix K - Certificates of Calibration
(Appendix pages K1 to K26 identical to pages E1 to E26)

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CERTIFICATE OF CALIBRATION

ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY
Certificate No. ACT-1272

Certification Number CK283-36818-427

For Eaton Corporation - ICD
W126 N7250 Flint Drive
Menomonee Falls, WI 53051

Purchase Order #	
Test Instrument	Weights
Make	Standard Weight
Model	Standard Weight
Serial Number	C2194
Identification	EM3931-2
Customer Location	ICD
Condition Received	In Tolerance
Condition Returned	In Tolerance
Calibrated By	Michael Frank
Technical Review By	Tim Bending
Calibration Location	FVM
Calibration Conditions	68.6°F, 20.3°C, 41.3%RH
Calibration Date	10/09/2020
Recalibration Due	10/09/2021

Procedures Followed
FVE-059 rev. 1

Form Revision 6: 02/04/2012

Standards Used

Instrument	Serial Number	Trace Number	Next Cal
FVS-019P	N/A	CK188-74019-614	06/30/2021
FVS-275A	RY11838	CK202-61167-614	07/31/2021
FVS-792	14737316	CK100-21449-466	04/30/2021

Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. (This is considered “shared responsibility.”) Uncertainties expressed in nominal units.

All instruments have been calibrated against standards traceable to NIST. Calibration was completed in accordance with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 and ANSI/NCSL Z540.3-2006. Other standards listed upon request.

Calibration Results

* denotes "Out of Tolerance"

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
ASTM E617 Class 7 Conventional Mass Correction				FVS-792	FVS-792	
2 lb	(g) 0.0	(g) -0.4	(g) 0.4	(g) -0.1	(g) -0.1	(g) 0.06

Comments
Test Weights Conventional Mass Correction Reference = C0000-WGHTS-FVM

Appendix K - Certificates of Calibration
(Appendix pages K1 to K26 identical to pages E1 to E26)

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CERTIFICATE OF CALIBRATION

ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY
Certificate No. ACT-1272

Certification Number CK283-37082-427

For Eaton Corporation - ICD
W126 N7250 Flint Drive
Menomonee Falls, WI 53051

Purchase Order #	
Test Instrument	Weights
Make	Standard Weight
Model	Standard Weight
Serial Number	C1701
Identification	EM3930-4
Customer Location	ICD
Condition Received	In Tolerance
Condition Returned	In Tolerance
Calibrated By	Michael Frank
Technical Review By	Tim Bending
Calibration Location	FVM
Calibration Conditions	68.6°F, 20.3°C, 41.3%RH
Calibration Date	10/09/2020
Recalibration Due	10/09/2021

Procedures Followed
FVE-059 rev. 1

Form Revision 6: 02/04/2012

Standards Used

Instrument	Serial Number	Trace Number	Next Cal
FVS-019P	N/A	CK188-74019-614	06/30/2021
FVS-114	13209856	CK129-29540-466	11/30/2020
FVS-275A	RY11838	CK202-61167-614	07/31/2021

Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. (This is considered “shared responsibility.”) Uncertainties expressed in nominal units.

All instruments have been calibrated against standards traceable to NIST. Calibration was completed in accordance with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 and ANSI/NCSL Z540.3-2006. Other standards listed upon request.

Calibration Results

* denotes "Out of Tolerance"

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
ASTM E617 Class 7 Conventional Mass Correction				FVS-114	FVS-114	
1 lb	(g) 0.00	(g) -0.27	(g) 0.27	(g) 0.06	(g) 0.06	(g) 0.006

Comments
Test Weights Conventional Mass Correction Reference = C0000-WGHTS-FVM

Appendix K - Certificates of Calibration
(Appendix pages K1 to K26 identical to pages E1 to E26)

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http://www.FoxValleyMetrology.com

CERTIFICATE OF CALIBRATION

ACCREDITED ISO/IEC 17025 CALIBRATION AND TESTING LABORATORY
Certificate No. ACT-1272

Certification Number CK281-48208-541

For Eaton Corporation - ICD
W126 N7250 Flint Drive
Menomonee Falls, WI 53051

Purchase Order #	
Test Instrument	Stopwatch
Make	Sportline
Model	220
Serial Number	
Identification	EM8101
Customer Location	ICD
Condition Received	In Tolerance
Condition Returned	In Tolerance
Calibrated By	Trevor Benish
Technical Review By	Kevin Dehne
Calibration Location	FVM
Calibration Conditions	69.5°F, 20.8°C, 41.4%RH
Calibration Date	10/07/2020
Recalibration Due	10/07/2021

Procedures Followed
FVE-033 rev. 1

Form Revision 6: 02/04/2012

Standards Used

Instrument	Serial Number	Trace Number	Next Cal
FVS-275A	RY11838	CK202-61167-614	07/31/2021
FVS-393	N/A	CK147-37289-397	05/31/2021

Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. (This is considered “shared responsibility.”) Uncertainties expressed in nominal units.

All instruments have been calibrated against standards traceable to NIST. Calibration was completed in accordance with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 and ANSI/NCSL Z540.3-2006. Other standards listed upon request.

Calibration Results

* denotes "Out of Tolerance"

Feature	Nominal	Lower Limit	Upper Limit	As Found	As Left	Uncertainty
Chronograph	(sec)	(sec)	(sec)	(sec)	(sec)	(sec)
	60.00	59.50	60.50	60.01	60.01	0.007
	60.00	59.50	60.50	60.01	60.01	0.007
	(sec)	(sec)	(sec)	(sec)	(sec)	(sec)
	300.00	299.50	300.50	300.02	300.02	0.006
	300.00	299.50	300.50	300.02	300.02	0.007

Second Revision No. 8059-NFPA 70-2018 [Section No. 110.14 [Excluding any Sub-Sections]]

Because of different characteristics of dissimilar metals, devices such as pressure terminal or pressure splicing connectors and soldering lugs shall be identified for the material of the conductor and shall be properly installed and used. Conductors of dissimilar metals shall not be intermixed in a terminal or splicing connector where physical contact occurs between dissimilar conductors (such as copper and aluminum,- ~~copper and copper-clad aluminum, or aluminum~~ or aluminum and copper-clad aluminum), unless the device is identified for the purpose and conditions of use. Materials such as solder, fluxes, inhibitors, and compounds, where employed, shall be suitable for the use and shall be of a type that will not adversely affect the conductors, installation, or equipment.

Connectors and terminals for conductors more finely stranded than Class B and Class C stranding as shown in Chapter 9, Table 10, shall be identified for the specific conductor class or classes.

Submitter Information Verification

Committee: NEC-P01
Submittal Date: Tue Oct 30 14:02:54 EDT 2018

Committee Statement

Committee Statement: Copper and copper-clad aluminum has been deleted from the dissimilar metal list for the application of this requirement.

Response Message: SR-8059-NFPA 70-2018

Public Comment No. 1361-NFPA 70-2018 [Section No. 110.14 [Excluding any Sub-Sections]]

Public Comment No. 18-NFPA 70-2021 [New Section after 110.16(B)]

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)

Statement of Problem and Substantiation for Public Comment

This public comment, and its companion PC-16 for Article 100, is identical to PI-2839, resolved by Panel 1 with the statement, "The term 'in sight from' appears many times throughout the Code. The existing Article 100 definition adds clarity and consistency to the Code wherever the term is used." This public comment, taken together with PC-16, moves the existing definition - that is in fact a requirement, as we shall show - from Article 100 to Article 110.

None would dispute that "in sight from" appears many times throughout the Code. Multiple citations do not necessarily make it a definition. It could be a definition, or a general requirement. We maintain that this one is a general requirement. Examples of general requirements that address multiple Code sections include 110.21(A), general requirements for reconditioned equipment, 110.21(B), general requirements for caution, warning, or danger signs and labels, and 110.25, general requirements for lockable disconnecting means. Note that 110.21(B) says, "where ... required by this Code," and 110.25 says, "If ... required ... elsewhere in this Code," These requirements are functionally identical to the opening words of the existing definition of "in sight from."

As written, the definition of In Sight From cannot stand as a definition. It is a clear violation of NEC Style Manual 2.2.2: "Definitions shall contain requirements or recommendations." The existing language contains requirements for visibility and distance (15 m), in addtion to having a mandatory opening to the sentence. The Scope of the NEC Style Manual says it "contains editorial and administrative requirements for writing NFPA 70 and NFPA 70E. Adherence to the NEC Style Manual is not optional. That is the reason the NEC Correlating Committee issued CN-404, directing CMP-1 to revise the definition to comply with 2.2.2 of the Style Manual.

This submitter has issued companion Public Comment 16 to delete the existing language from the definitions in Article 100. In simple terms, the language moves from Article 100 to Article 110 with no changes.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 16-NFPA 70-2021 [Definition: In Sight From (Within Sight From, Within Sight).]	Moving text from Art. 100 to Art. 110.

Related Item

• PI-2839 • PI-2837

Submitter Information Verification

Submitter Full Name: William Fiske
Organization: Intertek Testing Services
Affiliation: N/A
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jun 29 13:40:34 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action:	Rejected but see related SR
Resolution:	SR-7706-NFPA 70-2021
Statement:	A new requirement in 110.29 addresses “in sight from” for general use throughout the Code.

Public Comment No. 1286-NFPA 70-2021 [Section No. 110.16(B)]

~~**(B)** Service Equipment and Feeder Supplied Equipment.~~

In other than dwelling units, in addition to the requirements

~~in~~

in 110.16(A), a permanent

~~arc flash~~

label shall be field or factory applied to service equipment

~~and feeder supplied equipment rated 1000 amperes~~

rated 1200 amps or more. The

~~arc flash~~

label shall

~~be in accordance with acceptable industry practice and include the date the label was applied. The label shall~~

meet the requirements

~~of~~

of 110.21(B) and contain the following information:

- (1) Nominal system voltage
- (2) Available fault current at the service overcurrent protective devices
- (3) The clearing time of service overcurrent protective devices based on the available fault current at the service equipment
- (4) The date the label was applied

Exception:

Service equipment labeling shall not be required if an arc flash label is applied in accordance with acceptable industry practice.

Informational Note No. 1:

See NFPA 70E -2018, *Standard for Electrical Safety in the Workplace*, which provides guidance, such as determining severity of potential exposure, planning safe work practices, arc flash labeling, and selecting personal protective equipment.

Informational Note No. 2:

See ANSI Z535.4-2011 (R2017), *Product Safety Signs and Labels*,

~~for~~

which provides guidelines for the design of safety signs and labels for application to products.

Informational Note No.

~~2~~

3:

~~See~~

See *NFPA 70E*-

~~2021~~

2018, *Standard for Electrical Safety in the Workplace*

~~, for acceptable industry practices for equipment labeling. This standard~~

. It provides specific criteria for developing arc-flash labels for equipment that provides nominal system voltage, incident energy levels, arc-flash boundaries, minimum required levels of personal

protective equipment, and so forth.

Statement of Problem and Substantiation for Public Comment

This PC seeks to retain the 2020 language of this section, other than the style manual revisions to the informational notes. The 2020 language provided clear, enforceable, and useful requirements that could be used in conjunction with 70E to give an electrician guidance. What the CMP wants is already allowed in the exception, but the proposed revision makes for a requirement with no teeth. "acceptable industry practice" could mean nearly anything, as indicated by the corelating committee. This section was not broken, nor was it in need of fixing. If the CMP agrees with the substantiation in PI 439, which it appeared to, accepting the recommendations of that PI would be a better solution.

Related Item

• PI 439 • FR 8772

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Ryan Jackson
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 11 15:54:19 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: The changes made in the First Draft meeting, such as adding feeder equipment and the reduction from 1200 to 1000 amperes, increase worker safety. Label requirements are appropriately addressed in 110.21(B) and the reference in the informational note to NFPA 70E.

Public Comment No. 259-NFPA 70-2021 [Section No. 110.16(B)]

(B)

~~Service Equipment and Feeder Supplied Equipment~~
Service Equipment .

In other than dwelling units, in addition to the requirements

~~in 110~~

in 110 .16(A) , a permanent

~~arc flash~~

label shall be field or factory applied to service equipment

~~and feeder supplied equipment rated 1000 amperes~~

rated 1200 amps or more. The label shall meet the requirements of 110.21(B) and contain the following information:

(1) Nominal system voltage

(2) Available fault current at the service overcurrent protective devices

(3) The clearing time of service overcurrent protective devices based on the available fault current at the service equipment

(4) The date the label was applied

Exception: Service equipment labeling shall not be required if an arc flash label

~~shall be~~

is applied in accordance with acceptable industry practice

~~and include the date the label was applied. The label shall meet the requirements of 110.21(B) .~~

.

Informational Note No. 1: *NFPA 70E* -2018, *Standard for Electrical Safety in the Workplace* , provides guidance, such as determining severity of potential exposure, planning safe work practices, arc flash labeling, and selecting personal protective equipment.

Informational Note No.

~~1~~

2 :

~~See ANSI~~

ANSI Z535.4-2011

~~(R2017)~~

, *Product Safety Signs and Labels* ,

~~for~~

provides guidelines for the design of safety signs and labels for application to products.

Informational Note No.

~~2: See~~

3: Acceptable industry practices for equipment labeling are described in *NFPA 70E* -

~~2021~~

2018 , *Standard for Electrical Safety in the Workplace*

~~, for acceptable industry practices for equipment labeling~~

. This standard provides specific criteria for developing arc-flash labels for equipment that provides nominal system voltage, incident energy levels, arc-flash boundaries, minimum required levels of personal protective equipment, and so forth.

Statement of Problem and Substantiation for Public Comment

In case the formatting was unclear, I am proposing striking this change and reverting to the 2020 language. I

am primarily opposed to the change shown in the first draft due to the use of vague terms such as “acceptable industry practice.”

Arc flash studies are not always done on for example, hotels in all small jurisdictions, where they may have only one breaker (the main) that is 1000 amps. Some inspectors and contractors in certain areas may not have (or may not enter) factories in their jurisdiction, and thus may not have the same thinking of the definition of “acceptable industry practice” that some in other areas may have. Additionally, Acceptable Industry Practice (which the NEC doesn’t define except for a non-enforceable informational note on NFPA70E) sounds much like “accepted industry practice” which could lead to not doing anything because it’s just not what is commonly done in an area. Thus, by removing the 110.16B requirement and changing this to “acceptable industry practice” we could actually in some cases reduce safety by no longer clearly requiring information that could assist in determination of available incident energy.

Ambiguous language leading to situations where exactly what is “acceptable industry practice” is debated in a court room after an injury would be a circumstance indicative of a failure to achieve the NFPA’s mission -- this regardless of the outcome of any case.
We should either require an arc flash label and specify what that would be (incident energy levels, working distance, calorie levels, arc flash boundary, etc), or we should not require it.

I submit that this revision may a backtrack on electrical safety for the electrical worker, for the reason mentioned above. I also submit that the trend toward more incident energy analysis and attention to the hazards of arc flash incidents will likely continue its positive direction without this proposed change. Perhaps the best approach is to not make these changes and to look forward to the next revision cycle. Perhaps something as simple as adding a definition of arc flash label to article 100 in the 2026 cycle would suffice. Or, perhaps enough research could be done to allow an Annex to be added to the NEC, where for some installations standard tables could be used to determine arc flash incident hazard data.

If we should include the language in the first draft report, I believe we should change the wording to make it clearer that the arc flash label shall have sufficient information to communicate the level of incident energy at the specific piece of equipment. I think we should avoid the term “acceptable industry practice” to describe something that is a pretty big development in terms of a change in what is required to have a code compliant installation.

Related Item

• First Revision No. 8772-NFPA 70-2021 [Section No. 110.16(B)]

Submitter Information Verification

Submitter Full Name: Josh Weaver
Organization: Josh Weaver
Street Address:
City:
State:
Zip:
Submittal Date: Sat Jul 17 20:01:39 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: The changes made in the First Draft meeting, such as adding feeder equipment and the reduction from 1200 to 1000 amperes, increase worker safety. Label requirements are appropriately addressed in 110.21(B) and the reference in the informational note to NFPA 70E.

Public Comment No. 597-NFPA 70-2021 [Section No. 110.16(B)]

(B) Service Equipment and Feeder Supplied Equipment.

In other than dwelling units, in addition to the requirements in 110.16(A), a permanent arc flash label shall be field or factory applied to service equipment and feeder supplied equipment rated 1000 amperes or more. The arc flash label shall be in accordance with acceptable industry practice and include the date the label was applied. The label shall meet the requirements of 110.21(B).

Informational Note No. 1: See ANSI Z535.4-2011 (R2017), *Product Safety Signs and Labels*, for guidelines for the design of safety signs and labels for application to products.

Informational Note No. 2: See *NFPA 70E*-2021, *Standard for Electrical Safety in the Workplace*, for acceptable industry practices for equipment labeling. This standard provides specific criteria for developing arc-flash labels for equipment that provides nominal system voltage, incident energy levels, arc-flash boundaries, minimum required levels of personal protective equipment, and so forth.

Additional Proposed Changes

File Name	Description	Approved
1_CN_105.pdf	70_CN105	

Statement of Problem and Substantiation for Public Comment

The following CC Note No. 105 appeared in the First Draft Report on First Revisions No. 8772.

The Correlating Committee directs that this first revision be reviewed to comply with the NEC Style Manual. The use of the term "acceptable" in the rule and the Informational Note is listed in Table 3.2.1 of the NEC Style Manual, for possibly unenforceable and vague terms.
The Correlating Committee also directs this First Revision be referred to CMP-10 for information.

Related Item

• First Revision No. 8772

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 02 12:13:05 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7704-NFPA 70-2021
Statement: “Acceptable” is changed to “applicable” which eliminates a possible unenforceable and vague term per Table 3.2.1 of the NEC Style Manual.

Correlating Committee Note No. 105-NFPA 70-2021 [Section No. 110.16(B)]

Submitter Information Verification

Committee: NEC-P01
Submittal Date: Tue May 04 12:03:18 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs that this first revision be reviewed to comply with the NEC Style Manual. The use of the term "acceptable" in the rule and the Informational Note is listed in Table 3.2.1 of the NEC Style Manual, for possibly unenforceable and vague terms.

The Correlating Committee also directs this First Revision be referred to CMP-10 for information.

First Revision No. 8772-NFPA 70-2021 [Section No. 110.16(B)]

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. 1287-NFPA 70-2021 [Section No. 110.17]

~~**110.17** Servicing and Maintenance of Equipment.~~

~~Servicing and electrical preventive maintenance shall be performed by qualified persons trained in servicing and maintenance of equipment and shall comply with the following:~~

(1) ~~The servicing and electrical preventive maintenance shall be performed in accordance with the original equipment manufacturer's instructions and information included in the listing information, or as approved by the authority having jurisdiction.~~

(2) ~~The servicing and electrical preventive maintenance shall be performed using identified replacement parts that are verified under applicable product standards. The replacement parts shall comply with at least one of the following:~~

(3) ~~Be provided by the original equipment manufacturer~~

(4) ~~Be designed by an engineer experienced in the design of replacement parts for the type of equipment being serviced or maintained~~

(5) ~~Be approved by the authority having jurisdiction~~

~~Informational Note: For equipment that is not listed or field labeled, or for which components are no longer available from the original equipment manufacturer, one way to determine suitability is to review the documentation that accompanies the replacement parts.~~

Statement of Problem and Substantiation for Public Comment

The scope of the NEC is the INSTALLATION and REMOVAL of electrical equipment and conductors. It does not include the use or maintenance of equipment. This material is not only outside of the NEC's scope, but is unenforceable. How is an AHJ supposed to ensure who performs maintenance?

Related Item

• FR 8625

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Ryan Jackson
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 11 16:01:43 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR

Resolution:	SR-7732-NFPA 70-2021 This section is not deleted. It correlates with the definition of "reconditioned" and provides clarity by distinguishing between reconditioning and servicing activities and maintenance activities.
Statement:	"Applicable industry standards" and an informational note providing an example of information for preventative maintenance are added to provide additional clarity to the requirement.

Public Comment No. 1925-NFPA 70-2021 [Section No. 110.17]

110.17 ~~Servicing and Maintenance of Equipment.~~

~~Servicing and electrical preventive maintenance shall be performed by qualified persons trained in servicing and maintenance of equipment and shall comply with the following:~~

(1) ~~The servicing and electrical preventive maintenance shall be performed in accordance with the original equipment manufacturer's instructions and information included in the listing information, or as approved by the authority having jurisdiction.~~

(2) ~~The servicing and electrical preventive maintenance shall be performed using identified replacement parts that are verified under applicable product standards. The replacement parts shall comply with at least one of the following:~~

(3) ~~Be provided by the original equipment manufacturer~~

(4) ~~Be designed by an engineer experienced in the design of replacement parts for the type of equipment being serviced or maintained~~

(5) ~~Be approved by the authority having jurisdiction~~

~~Informational Note: For equipment that is not listed or field labeled, or for which components are no longer available from the original equipment manufacturer, one way to determine suitability is to review the documentation that accompanies the replacement parts.~~

Statement of Problem and Substantiation for Public Comment

New 110.17 should not be added. New 110.17 adds requirements on who can perform servicing and maintenance which is outside the scope of the NEC. The proposed language is also overly prescriptive and does not recognize the use of industry standards like NFPA 70B for performing servicing and maintenance. It is unreasonable to expect an AHJ to inspect and approve individual replacement parts on serviced equipment where the original equipment manufacturer no longer exists.

Related Item

• FR-8625

Submitter Information Verification

Submitter Full Name: Louis Barrios
Organization: Shell Global Solutions
Affiliation: American Chemistry Council
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 18 16:39:22 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action:	Rejected but see related SR
Resolution:	SR-7732-NFPA 70-2021 This section is not deleted. It correlates with the definition of “reconditioned” and provides clarity by distinguishing between reconditioning and servicing activities and maintenance activities.
Statement:	“Applicable industry standards” and an informational note providing an example of information for preventative maintenance are added to provide additional clarity to the requirement.

Public Comment No. 249-NFPA 70-2021 [Section No. 110.17]

~~**110.17** Servicing and Maintenance of Equipment.~~

~~Servicing and electrical preventive maintenance shall be performed by qualified persons trained in servicing and maintenance of equipment and shall comply with the following:~~

(1) ~~The servicing and electrical preventive maintenance shall be performed in accordance with the original equipment manufacturer's instructions and information included in the listing information, or as approved by the authority having jurisdiction.~~

(2) ~~The servicing and electrical preventive maintenance shall be performed using identified replacement parts that are verified under applicable product standards. The replacement parts shall comply with at least one of the following:~~

(3) ~~Be provided by the original equipment manufacturer~~

(4) ~~Be designed by an engineer experienced in the design of replacement parts for the type of equipment being serviced or maintained~~

(5) ~~Be approved by the authority having jurisdiction~~

~~Informational Note: For equipment that is not listed or field labeled, or for which components are no longer available from the original equipment manufacturer, one way to determine suitability is to review the documentation that accompanies the replacement parts.~~

Statement of Problem and Substantiation for Public Comment

In many ways this section is just a repeat of what is already known and required by the code, by the licensing authorities of the states, and by OSHA. Redundant repetition can have the effect over time of generating confusion, exasperation, misinterpretation, making the code overly long and making it have less relevant material per a given page.

It is known that all electrical work shall only be performed by qualified persons, not just specific types of electrical work.
It is also known well by qualified persons that you follow manufacturer instructions.
The only real requirements here that may not already be in the NEC repeatedly are 110.17 2 b&c. However, the way that is worded it says either engineer approval or approval by the AHJ, meaning there's room for an engineer to argue the AHJ doesn't have the authority to reject.

Thus, it seems this section is not needed.

Related Item

• First Revision No. 8625-NFPA 70-2021 [Global Input]

Submitter Information Verification

Submitter Full Name: Josh Weaver
Organization: Josh Weaver
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jul 15 19:47:32 EDT 2021

Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-7732-NFPA 70-2021 This section is not deleted. It correlates with the definition of "reconditioned" and provides clarity by distinguishing between reconditioning and servicing activities and maintenance activities.

Statement: "Applicable industry standards" and an informational note providing an example of information for preventative maintenance are added to provide additional clarity to the requirement.

Public Comment No. 47-NFPA 70-2021 [Section No. 110.17]

110.17 Servicing and Maintenance of Equipment.

Servicing and electrical preventive maintenance, in other than one- and two-family dwelling units, shall be performed by qualified persons trained in servicing and maintenance of equipment and shall comply with the following:

(1) The servicing and electrical preventive maintenance shall be performed in accordance with the original equipment manufacturer's instructions and information included in the listing information, or as approved by the authority having jurisdiction.

(2) The servicing and electrical preventive maintenance shall be performed using identified replacement parts that are verified under applicable product standards. The replacement parts shall comply with at least one of the following:

(3) Be provided by the original equipment manufacturer

(4) Be designed by an engineer experienced in the design of replacement parts for the type of equipment being serviced or maintained

(5) Be approved by the authority having jurisdiction

Informational Note: For equipment that is not listed or field labeled, or for which components are no longer available from the original equipment manufacturer, one way to determine suitability is to review the documentation that accompanies the replacement parts.

Statement of Problem and Substantiation for Public Comment

Relief needs to be provided to residential dwelling units for the servicing and maintenance of electrical equipment and appliances that are in Chapter 4 of the NEC. The proposed change will also provide correlation with the scope of NFPA 70B which is in the process of becoming a standard for the servicing and maintenance of electrical equipment. The proposed language will not impact the maintenance requirements in Chapter 5-7, as those Chapters are permitted to modify the requirement in 110.17.

Related Item

• Global FR 8625

Submitter Information Verification

Submitter Full Name: Brian Baughman
Organization: Generac Power Systems Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jun 30 12:59:15 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected
Resolution: Adequate substantiation has not been provided as to why one- and two-family dwelling units should be excluded.

Public Comment No. 8-NFPA 70-2021 [Section No. 110.17]

~~**110.17** Servicing and Maintenance of Equipment.~~

~~Servicing and electrical preventive maintenance shall be performed by qualified persons trained in servicing and maintenance of equipment and shall comply with the following:~~

(1) ~~The servicing and electrical preventive maintenance shall be performed in accordance with the original equipment manufacturer's instructions and information included in the listing information, or as approved by the authority having jurisdiction.~~

(2) ~~The servicing and electrical preventive maintenance shall be performed using identified replacement parts that are verified under applicable product standards. The replacement parts shall comply with at least one of the following:~~

(3) ~~Be provided by the original equipment manufacturer~~

(4) ~~Be designed by an engineer experienced in the design of replacement parts for the type of equipment being serviced or maintained~~

(5) ~~Be approved by the authority having jurisdiction~~

~~Informational Note: For equipment that is not listed or field labeled, or for which components are no longer available from the original equipment manufacturer, one way to determine suitability is to review the documentation that accompanies the replacement parts.~~

Statement of Problem and Substantiation for Public Comment

Delete this section. This new language is outside the purview of the NEC and is within the purview of NFPA 70B. In addition, the language (1) would act to prohibit the rewinding of motors. That is a very common practice but is mostly accomplished by reverse engineering the motor as re-winding instructions are not typically provided by the OEM.

Related Item

• FR-8625

Submitter Information Verification

Submitter Full Name: Don Ganiere
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jun 29 11:54:26 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR

Resolution:	SR-7732-NFPA 70-2021 This section is not deleted. It correlates with the definition of “reconditioned” and provides clarity by distinguishing between reconditioning and servicing activities and maintenance activities.
Statement:	“Applicable industry standards” and an informational note providing an example of information for preventative maintenance are added to provide additional clarity to the requirement.

Public Comment No. 598-NFPA 70-2021 [Section No. 110.18]

110.18 Arcing Parts.

Parts of electrical equipment that in ordinary operation produce arcs, sparks, flames, or molten metal shall be enclosed or separated and isolated from all combustible material.

Additional Proposed Changes

File Name	Description	Approved
1_CN_106.pdf	70_CN106	

Statement of Problem and Substantiation for Public Comment

The following CC Note No. 106 appeared in the First Draft Report on First Revisions No. 8565.

The Correlating Committee directs that this first revision be referred to Code-Making Panel 11 and Code-Making Panel 14 for information.

Related Item

• First Revision No. 8565

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 02 12:25:17 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected
Resolution: CMP-1 recommends that CMP-11 and CMP-14 review this section.

Correlating Committee Note No. 106-NFPA 70-2021 [Section No. 110.18]

Submitter Information Verification

Committee: NEC-P01
Submittal Date: Tue May 04 12:15:11 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs that this first revision be referred to Code-Making Panel 11 and Code-Making Panel 14 for information.

First Revision No. 8565-NFPA 70-2021 [Section No. 110.18]

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. 1934-NFPA 70-2021 [Section No. 110.20]

110.20 Reconditioned Equipment.

Reconditioned equipment shall be permitted except where prohibited elsewhere in this *Code*. ~~Equipment that is restored to operating condition shall be reconditioned with identified replacement parts, verified under applicable standards, that are either provided by the original equipment manufacturer or that are designed by an engineer experienced in the design of replacement parts for the type of equipment being reconditioned.~~

(A) Equipment Required to Be Listed.

Equipment that is reconditioned and required by this *Code* to be listed shall be listed or field labeled as reconditioned ~~using available instructions from the original equipment manufacturer.~~

~~**(B)** Equipment Not Required to Be Listed.~~

~~Equipment that is reconditioned and not required by this *Code* to be listed shall comply with one of the following:~~

(1) ~~Be listed or field labeled as reconditioned~~

(2) ~~Have the reconditioning performed in accordance with the original equipment manufacturer instructions~~

~~**(C)** Approved Equipment.~~

~~If the options specified in 110.20(A) or (B) are not available, the authority having jurisdiction shall be permitted to approve reconditioned equipment, and the reconditioner shall provide the authority having jurisdiction with documentation of the changes to the product.~~

Statement of Problem and Substantiation for Public Comment

The requirements in new 110.20 are overly prescriptive and provide new and burdensome requirements for use of replacement parts. Quite often, OEM replacement parts are not available and the requirements for parts to be designed by engineers experienced in the design of replacement parts is vague and unenforceable. 110.20(B) is deleted because it is confusing. It states that equipment not required to be listed are required to be listed or field labeled. Why? This seems contradictory. Often OEM instructions on older equipment are not available. As proposed, the new requirements would require listing, field labeling or AHJ approval for many "reconditioned" motors and other equipment not originally required to be listed since original equipment manufacturer instructions for "reconditioning" are often not available. 110.20(C) is deleted because it is not necessary if 110.20(B) is deleted.

Related Item

• FR-8663

Submitter Information Verification

Submitter Full Name: Louis Barrios
Organization: Shell Global Solutions
Affiliation: American Chemistry Council
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 18 16:59:21 EDT 2021

Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: Guidance for what is acceptable to use for reconditioning the equipment is needed as not all equipment may have available parts to be used. Not all equipment may have a reconditioning program that allows for listing of the reconditioned equipment, therefore, options have been provided to guide the AHJ and users of this Code into what is acceptable.

Public Comment No. 669-NFPA 70-2021 [Section No. 110.21(A)(1)]

(1) General.

The manufacturer's name, trademark, or other descriptive marking by which the organization responsible for the product can be identified shall be ~~placed on~~ applied or affixed onto all electrical equipment. Other markings that indicate voltage, current, wattage, or other ratings shall be provided as specified elsewhere in this *Code*. The marking shall be of sufficient durability to withstand the environment involved.

Statement of Problem and Substantiation for Public Comment

I take the CMP's point that applying multiple manufacturers' identification should not be required. I am sure Mr. Rock can provide a comment to resolve that concern. However, the panel said nothing to negate this part of Mr. Rock's proposal.

Its benefit is emphasizing the need to secure the markings onto the equipment, when possible, in place of using than the looser term "placed on." This is important enough to inspectors and installers both that I believe this change is worth making.

Related Item

• PI 1940

Submitter Information Verification

Submitter Full Name: David Shapiro
Organization: Safety First Electrical
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 03 09:11:20 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Accepted
Resolution: SR-7751-NFPA 70-2021
Statement: The section is revised to clarify that labels should be applied or affixed onto, instead of merely placing on equipment. The phrase "placed on" is revised to "applied or affixed onto" which clarifies the requirement. Simply placing the manufacturer's name, trademark, or other descriptive marking by which the organization responsible for the product can be identified on all electrical equipment is not what is required. It must also be applied or affixed – not simply just be placed there.

Public Comment No. 1389-NFPA 70-2021 [Section No. 110.22(A)]

(A) General.

Each disconnecting means shall be legibly marked to indicate its purpose unless located and arranged so the purpose is evident. In other than one- or two-family dwellings, the marking shall include the identification and location of the circuit source that supplies the disconnecting means. The marking shall be of sufficient durability to withstand the environment involved.

Informational Note: Considerations for testing for the absence of voltage should be made at the time of installation. If test points are insulated or not readily accessible due to the presence of barriers or guards, consider utilizing a permanently mounted absence of voltage tester (AVT). NFPA 70E provides guidance for safely verifying the absence of voltage.

Statement of Problem and Substantiation for Public Comment

With insulation and barrier requirements becoming more common, it is increasingly difficult in certain situations to safely test for the absence of voltage with a portable tester. NFPA 70E has recognized both portable testers and permanently mounted absence of voltage testers as acceptable methods for verifying the absence of voltage since 2018. Permanently mounted absence of voltage testers can significantly reduce risk and exposure to electrical hazards when testing for absence of voltage. However, because it is permanently mounted, the tester has to be considered during the installation of the equipment. Adding an informational note that encourages equipment designers and installers to consider how absence of voltage testing will be performed will lead to increased safety of those who operate and maintain the equipment after it is installed, regardless of whether portable or permanently-mounted testers are used. This informational note does not require absence of voltage testers, but only seeks to make people aware that there are multiple methods to accomplish this task and points the user of the standard to NFPA 70E for more information on this topic. If this topic is not considered at the time of installation, it may not be possible to mitigate testing risks later during the life of the equipment.

Related Item

• PI 3835 • FR 9522

Submitter Information Verification

Submitter Full Name: Rachel Bugaris
Organization: Panduit Corp
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 12 14:03:34 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: Per 3.1.3, in part, of the NEC Style Manual, informational notes shall only be used where necessary to support or improve usability of the associated requirement. Informational notes shall not be written in mandatory language and shall not contain requirements, make interpretations, or make recommendations. If an Informational note is needed to explain the text of the document, consideration should be given to rewriting the text of the document to make the rule clear. The rule is clear as written. Accordingly, an informational note is unnecessary.

Further, per 90.1(A) in the 2020 NEC, in part, the Code “is not intended as a design specification...” Accordingly, it is inappropriate to add “an informational note that encourages equipment designers and installers to consider how absence of voltage testing will be performed” as the recommendation uses as substantiation for the proposed revision.

Public Comment No. 1632-NFPA 70-2021 [Section No. 110.22(A)]

(A) General.

Each disconnecting means shall be legibly marked to indicate its purpose unless located and arranged so the purpose is evident. ~~In other than one- or two-family dwellings, the marking shall include the identification and location of the circuit source that supplies the disconnecting means.~~ The marking shall be of sufficient durability to withstand the environment involved.

Statement of Problem and Substantiation for Public Comment

The Committee Statement addresses a few things, although they are not correct. Firstly, my PI does not add any marking requirements, it removes them. The committee did clarify its intent in its statement when it makes clear that marking is only required when the purpose is evident. That is good to hear, but it verifies my position that the rule does not do what it is intended to do. If I have a motor at a large commercial building and I want to de-energize the line side of its disconnect so I can change fuses, for example, I do not need to mark the location of its source circuit if I can see what the disconnect controls (the motor). This defies the whole purpose needing to mark the disconnect. The fact that I know what it DOES doesn't mean I know how to SHUT IT OFF. I need to know how to shut off the line side of the disconnect so that I know how to work on it. The language added in the 2020 does not provide the electrician with the information that the rule sought to provide

Related Item

• PI 3798

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Ryan Jackson
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 16 18:14:45 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: The submitter has not included adequate technical substantiation to warrant a change. Evidence is necessary to demonstrate that the requirement is unenforceable or overly burdensome as presently written. The requirement is clear that the disconnecting means shall be marked unless their purpose is evident, and that the marking shall include the identification and location of the circuit source, not the load.

Public Comment No. 1949-NFPA 70-2021 [Section No. 110.22(A)]

(A) General.

Each disconnecting means shall be legibly marked to indicate its purpose unless located and arranged so the purpose is evident. In other than one- or two-family dwellings, the marking shall include the identification and location of the circuit source that supplies the disconnecting means unless located and arranged so the identification and location of the circuit source is evident . The marking shall be of sufficient durability to withstand the environment involved.

Statement of Problem and Substantiation for Public Comment

FR-8583 added "location" so that both the identification and location of the circuit source is required to be marked on each disconnecting means. The identification and location of the circuit source should not need to be identified on disconnecting means such as in motor control centers and switchgear when it is evident that the source is from the main breaker (or other disconnecting means), which is often located in the same equipment. The first sentence in 110.22(A) states that marking the purpose is not necessary if "located and arranged so the purpose is evident". The proposed modification clarifies that marking is also not necessary if the "identification and location of the circuit source is evident".

Related Item

• FR-8583

Submitter Information Verification

Submitter Full Name: Louis Barrios
Organization: Shell Global Solutions
Affiliation: American Chemistry Council
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 18 17:46:36 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Accepted
Resolution: SR-7762-NFPA 70-2021
Statement: The additional text clarifies that the identification and location of the circuit source does not need to be marked on the disconnecting means if the location of the source is evident.

Public Comment No. 247-NFPA 70-2021 [Section No. 110.22(A)]

(A) General.

Each disconnecting means shall be legibly marked to indicate its purpose unless located and arranged so the purpose is evident. In other than one- or two-family dwellings, the marking shall include the identification ~~and location~~ of the circuit source that supplies the disconnecting means. The marking shall be of sufficient durability to withstand the environment involved.

Statement of Problem and Substantiation for Public Comment

While this revision would certainly improve safety in many installations, it may not be practical for all installations. In some facilities, a description of the area in which the supply side disconnect for a piece of equipment is may be infeasible. In others, the description of the location could become quite large. This requirement would also rely on the design having designated a name for each room, and one that will be marked permanently, such that all future users of the building may benefit from it. Not all buildings are so constructed, and thus not all buildings would benefit from this.

In a number of cases, such as large scale solar facilities, the name of an overcurrent device protecting a piece of equipment (and that could be used as the disconnect) may be marked such on a map. So for instance switchboard 1 CKT#4 may be the name of both the supplying equipment, and the marked location on the map. Encouraging an improvisation of naming locations may impede safety.

If the committee does adopt this language, it would be requested to add an exception for installations where conditions of maintenance and supervision ensure that only qualified persons service the installation. In those installations, a marking of the source name but not location may suffice. Otherwise, make the language more restrictive such that it would apply to those installations that would benefit from the rule.

Related Item

• Public Input No. 2563-NFPA 70-2020 [Section No. 110.22(A)]

Submitter Information Verification

Submitter Full Name: Josh Weaver
Organization: Josh Weaver
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jul 15 18:30:00 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: Requiring location improves safety in many installations. Section 90.4(C) allows “by special permission, the authority having jurisdiction may waive specific requirements in this Code or permit alternative methods where it is assured that equivalent objectives can be achieved by establishing and maintaining effective safety” in the limited cases where the AHJ determines that it may not be practical to document the “location” for a particular installation to meet this requirement.

Public Comment No. 599-NFPA 70-2021 [Section No. 110.24(A)]

(A) Field Marking.

Service equipment at other than dwelling units shall be legibly marked in the field with the available fault current. The field marking(s) shall include the date the fault-current calculation was performed and be of sufficient durability to withstand the environment involved. The calculation shall be documented and made available to those authorized to design, install, inspect, maintain, or operate the system.

Informational Note No. 1: The available fault-current marking(s) addressed in 110.24 is related to required short-circuit current and interrupting ratings of equipment. See *NFPA 70E*-2021, *Standard for Electrical Safety in the Workplace,* for assistance in determining the severity of potential exposure, planning safe work practices, and selecting personal protective equipment.

Informational Note No. 2: Values of available fault current for use in determining appropriate minimum short-circuit current and interrupting ratings of service equipment are available from electric utilities in published or other forms.

Additional Proposed Changes

File Name	Description	Approved
1_CN_107.pdf	70_CN107	

Statement of Problem and Substantiation for Public Comment

The following CC Note No. 107 appeared in the First Draft Report on First Revisions No. 8361.

The Correlating Committee directs that this first revision be rewritten to comply with the NEC Style Manual, Section 4.1.3 Reference Structure. The Informational Note No. 1 needs to be revised to comply with the NEC Style Manual.

Related Item

• First Revision No. 8361

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 02 12:30:10 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7763-NFPA 70-2021
Statement: The informational note is revised to comply with the NEC Style Manual, Section 4.1.3, Reference Structure.

Correlating Committee Note No. 107-NFPA 70-2021 [Section No. 110.24(A)]

Submitter Information Verification

Committee: NEC-P01
Submittal Date: Tue May 04 12:16:33 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs that this first revision be rewritten to comply with the NEC Style Manual, Section 4.1.3 Reference Structure. The Informational Note No. 1 needs to be revised to comply with the NEC Style Manual.

First Revision No. 8361-NFPA 70-2021 [Section No. 110.24(A)]

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. 2196-NFPA 70-2021 [Section No. 110.25]

110.25 Lockable Disconnecting Means.

If a disconnecting means is required to be lockable open elsewhere in this *Code*, it shall be capable of being locked in the open position. The provisions for locking shall remain in place with or without the lock installed.

Exception: Locking provisions for a cord-and-plug connection shall not be required to remain in place without the lock installed.

Statement of Problem and Substantiation for Public Comment

This public comment is submitted to further oppose the requirement for, or informational note for, an absence of voltage tester, as per public input 3835. These testers have their limits in usefulness or on their impact on safety. They are not a substitute for qualified people. Also, there is no reason why the NEC should promote them above that of the other 70E required or allowed means.

I do not believe the statements given in the public input that created this constitute substantiation. We should be using the NEC to drive safety, not sales of products. This is one of multiple ways to test for absence of voltage, thus it shouldn't have its own informational note to elevate it above others. A public input to require or to discuss these devices was submitted for many articles, and in most other cases, rejected.

Here's why I don't believe there is substantiation given in the public input:
Example 1:
The author mentions some instances of improper manufacture of disconnects that lead to incidents. Such a thing is possible with these relatively new devices as well.

Example 2:
The author mentions some instances of improper manufacture of disconnects that lead to incidents. Such a thing is possible with these relatively new devices as well.

Example 3:
The author mentions more issues with manufacturing and/or installation. This time, toggle or drum switches. In this case it's not clear if these were toggle switches controlling utilization loads or a contactor. If the latter, it goes to illustrate how an improper install of a multi-component system (including one with absence of voltage testers) can lead to a hazardous situation. Again, no evidence that these components can't be faultily manufactured or applied just like the case of these drum/toggle switches.

1. Report ID: 0728900
From the information in the public input, it can not be determined that if the disconnect (normally not located on the equipment) had been off, locked out, and verified de-energized with one of these absence of voltage testers, that the employee would not have been able to be injured by contact with the capacitor.

2. Report ID: 0420600
Again like above here, no evidence is given in the public input that the capacitor would have been discharged, had the absence of voltage tester been on the disconnect. Many times, it wouldn't have been. It could be downstream of the disconnect with the tester and on the load side of a contactor, such that the absence of voltage tester wouldn't have seen it. In both this and the case above, the narrative in the report doesn't support even an idea that had the employee locked out the disconnect and tested it (with or without the absence of voltage tester), that the hazard caused by the capacitor wouldn't have presented itself.

3. Report ID: 0316300
In this case, an employee had a possibly untrained helper shut off a breaker. Report doesn't say if said breaker is at the equipment or in a panelboard (which might be seperate from the purview of this article). Regardless, the employee failed to verify a de-energized condition. The narrative that had the tester device been present, the unqualified person would have known what it meant and would have told the other worker may be incorrect. These devices are only helpful to qualified persons.

4. Report ID: 0452110
From the text given in the public input, we can not determine that an absence of voltage tester would have mitigated this tragedy. It involved an unlabeled breaker, and an assumption someone shouldn't have made. The absense of voltage tester can present the same hazards if improperly applied or maintained. Furthermore, even if the absense of voltage tester had been properly installed at the panelboard, it would still be hazardous to rely on it meaning a wire in the junction box is safe to work on for the same reason. Someone relying on one of these devices located in a breaker panel to clearly indicate that a wire in a multi circuit junction box far from it is de-energized would be hazardous for a number of reasons. If anything, this would be a cautionary tale of the dangers of over-applying these devices.

5. Report ID 0522300
This one doesn't indicate at all that an absence of voltage tester would have prevented this incident. It seems there was no regard for shutting off the equipment at all. The device only works if someone cares to shut the equipment off.

6. Report ID 0729700
Again, another tragedy caused by improper workmanship and improper work practices. From the text of the report in this public input, we see nothing to conclude that had one of these been installed, that the wiring that was associated with another circuit would have been detected.

These devices don't replace qualified people – in most cases they only indicate what part of a piece of equipment are de-energized, and thus they are only useful to qualified persons. They could create greater hazards to unqualified persons.

These devices are only accurate if installed on the correct location of a circuit. In some industrial facilities, there may be stickers indicating the one line throughout the switch gear. These facilities take great care to document and properly install their equipment. In these facilities, one might be able to trust that one of these is properly installed, and usable to a qualified person. In other facilities, these devices may be improperly interpreted as to what points of a circuit are deenergizd when they indicate a de-energized position. Thus, these devices have their limits and risks.

These devices may be best used by facility owners who have the confidence in the work they did to install and maintain them, in order to allow their employees to rely on them. Installing them on every piece of equipment may not help safety due to both possible improper install, neglect, improper interpretation of what they indicate. The idea that these will improve safety across the board would have to be routed in an idea that they are a replacement for qualified people, when they aren't.

These very useful devices will continue to have a positive impact on the industry. Requiring them everywhere, and putting notes about them in the NEC may not promote safety, however, for the reasons stated above.

Related Item

• Public Input No. 3835-NFPA 70-2020 [New Section after 110.25]

Submitter Information Verification

Submitter Full Name: Josh Weaver
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 19 16:20:58 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: The submitter has not proposed a revision to the first draft. Accordingly, the Public Comment does not meet the requirements of Section 4.4.4 of Regulations Governing the Development of NFPA Standards. Specifically, 4.4.4.3, in part, requires: (c) Proposed text of the Public Comment, including the wording to be added, revised (and how revised), or deleted. The changes shall be indicated through the use of underlines for new text and strikethrough for deleted text. (d) Statement of the problem and substantiation for the Public Comment. (e) Supporting data and scientific evidence, when available. Further, 4.4.4.4 provides that a comment that does not include all the required information listed in 4.4.4.3 (a) through (g) may be rejected by the technical committee for that reason.

Public Comment No. 746-NFPA 70-2021 [Section No. 110.25]

110.25 Lockable Disconnecting Means.

If a disconnecting means is required to be lockable open elsewhere in this *Code*, it shall be capable of being locked in the open position. The provisions for locking shall remain in place with or without the lock installed. If the disconnecting

means exposes any energized terminals or wiring when the cover is opened, the enclosure shall be

locked or require a tool to open

Exception: Locking provisions for a cord-and-plug connection shall not be required to remain in place without the lock installed.

Statement of Problem and Substantiation for Public Comment

I performed an informal survey of homeowners to find out whether they knew what the tabs on AC disconnects are for, what danger there might be, and that their holes are designed so as to accommodate a padlock (or a nut and bolt). Two knew: a scientist and a man who writes for do-it-yourselfers; the rest of the homeowners were pretty clueless. I have to conclude that requiring installers to use enclosures that are theoretically lockable is not enough to protect users. At present, these are not tucked away in cabinets with screw-fastened covers. The latter do at least discourage some unqualified persons from delving inside.

If this language is added, it does not automatically carry with it any hardship or expense. If an AHJ chooses to accept the installation of a cutout box with a press-tab latch, so long as the installer puts a double-nutted, or even single-nutted machine screw through it, that's within their authority. Now it requires the use of a tool to open, and a kid messing around won't find it that easy. Leave out the nut and bolt, and it will be in violation. Additional materials cost associated with compliance? Trivial. Time to install? A minute, if you drop a nut.

This is related to FR7861
404.30 Switch Enclosures with Doors.
Switch mechanisms mounted within enclosures with doors that, when opened, expose uninsulated live parts shall be constructed so that either a tool is required to open the door or other approved means to restrict interior access by unqualified persons are provided.

The difference in the present language is the addition of energized conductors, rather than just uninsulated parts. I believe this is justified by the fact that while intact, insulated conductors may not pose substantial risk to curious fingers, splices are also insulated--but even more vulnerable.

Related Item

• PI 376 • PI 3738 • PI 1423

Submitter Information Verification

Submitter Full Name: David Shapiro
Organization: Safety First Electrical
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 03 16:10:03 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action:	Rejected
Resolution:	The proposed addition is not relevant to when a disconnecting means is required to be lockable open and does not add clarity to the requirement.

Public Comment No. 967-NFPA 70-2021 [Section No. 110.26(A)]

(A) Working Space.

Working space for equipment operating at 1000 volts, nominal, or less to ground and likely to require examination, adjustment, servicing, or maintenance while energized shall comply with the dimensions of 110.26(A)(1), (A)(2), (A)(3), and (A)(4) or as required or permitted elsewhere in this *Code*.

Informational Note: See *NFPA 70E*-2021, *Standard for Electrical Safety in the Workplace*, for guidance, such as determining severity of potential exposure, planning safe work practices including establishing an electrically safe work condition, arc flash labeling, and selecting personal protective equipment.

(1) Depth of Working Space.

The depth of the working space in the direction of live parts shall not be less than that specified in Table 110.26(A)(1) unless the requirements of 110.26(A)(1)(a), (A)(1)(b), or (A)(1)(c) are met. Distances shall be measured from the exposed live parts or from the enclosure or opening if the live parts are enclosed.

Table 110.26(A)(1) Working Spaces

Nominal Voltage to Ground	Minimum Clear Distance		
	Condition 1	Condition 2	Condition 3
0–150	900 mm (3 ft)	900 mm (3 ft)	900 mm (3 ft)
151–600	900 mm (3 ft)	1.0 m (3 ft 6 in.)	1.2 m (4 ft)
601–1000	900 mm (3 ft)	1.2 m (4 ft)	1.5 m (5 ft)

Note: Where the conditions are as follows:

Condition 1 — Exposed live parts on one side of the working space and no live or grounded parts on the other side of the working space, or exposed live parts on both sides of the working space that are effectively guarded by insulating materials.

Condition 2 — Exposed live parts on one side of the working space and grounded parts on the other side of the working space. Concrete, brick, or tile walls shall be considered as grounded.

Condition 3 — Exposed live parts on both sides of the working space.

(a) *Dead-Front Assemblies.* Working space shall not be required in the back or sides of assemblies, such as dead-front switchboards, switchgear, or motor control centers, where all connections and all renewable or adjustable parts, such as fuses or switches, are accessible from locations other than the back or sides. Where rear access is required to work on nonelectrical parts on the back of enclosed equipment, a minimum horizontal working space of 762 mm (30 in.) shall be provided.

(b) *Low Voltage.* By special permission, smaller working spaces shall be permitted where all exposed live parts operate at not greater than 30 volts rms, 42 volts peak, or 60 volts dc.

(c) *Existing Buildings.* In existing buildings where electrical equipment is being replaced, Condition 2 working clearance shall be permitted between dead-front switchboards, switchgear, enclosed panelboards, or motor control centers located across the aisle from each other where conditions of maintenance and supervision ensure that written procedures have been adopted to prohibit equipment on both sides of the aisle from being open at the same time and qualified persons who are authorized will service the installation.

(d) *All installations* : open equipment doors shall not impede the entry to or egress from the working space.

Informational note to d): Hazards can be posed by doors on equipment which due to being positioned opposite a wall could, when open, impede the egress in such a way as to create additional shock hazards or inhibit quick exit of the area in the event of an emergency. Examples may include cases where one or more doors can be held open or when 2 adjacent doors open to hit eachother. Methods to address doors impeding working space may include changing the swing direction of doors, using doors without a hold open latch feature, reducing the size of doors by using equipment with double doors, or increasing the depth of the working space by recalculating the required working space in table 110.26A1, measuring from the edge of an opened door to the surface opposite of it.

(2) Width of Working Space.

The width of the working space in front of the electrical equipment shall be the width of the equipment or 762 mm (30 in.), whichever is greater. In all cases, the work space shall permit at least a 90 degree opening of equipment doors or hinged panels.

- ~~Open equipment doors shall not impede the entry to or egress from the working space.~~

(3) Height of Working Space.

The work space shall be clear and extend from the grade, floor, or platform to a height of 2.0 m (6½ ft) or the height of the equipment, whichever is greater. Within the height requirements of this section, other equipment or support structures, such as concrete pads, associated with the electrical installation and located above or below the electrical equipment shall be permitted to extend not more than 150 mm (6 in.) beyond the front of the electrical equipment.

Exception No. 1: On battery systems mounted on open racks, the top clearance shall comply with 480.10(D).

Exception No. 2: In existing dwelling units, service equipment or enclosed panelboards that do not exceed 200 amperes shall be permitted in spaces where the height of the working space is less than 2.0 m (6½ ft).

Exception No. 3: Meters that are installed in meter sockets shall be permitted to extend beyond the other equipment. The meter socket shall be required to follow the rules of this section.

(4) Limited Access.

Where equipment operating at 1000 volts, nominal, or less to ground and likely to require examination, adjustment, servicing, or maintenance while energized is required by installation instructions or function to be located in a space with limited access, all of the following shall apply:

(1) Where equipment is installed above a lay-in ceiling, there shall be an opening not smaller than 559 mm × 559 mm (22 in. × 22 in.), or in a crawl space, there shall be an accessible opening not smaller than 559 mm × 762 mm (22 in. × 30 in.).

(2) The width of the working space shall be the width of the equipment enclosure or a minimum of 762 mm (30 in.), whichever is greater.

(3) All enclosure doors or hinged panels shall be capable of opening a minimum of 90 degrees.

(4) The space in front of the enclosure shall comply with the depth requirements of Table 110.26(A)(1) and shall be unobstructed to the floor by fixed cabinets, walls, or partitions. Space reductions in accordance with 110.26(A)(1)(b) shall be permitted. The maximum height of the working space shall be the height necessary to install the equipment in the limited space. A horizontal ceiling structural member or access panel shall be permitted in this space provided the location of weight-bearing structural members does not result in a side reach of more than 150 mm (6 in.) to work within the enclosure.

(5) Separation from High-Voltage Equipment.

Where switches, cutouts, or other equipment operating at 1000 volts, nominal, or less are installed in a vault, room, or enclosure where there are exposed live parts or exposed wiring operating over 1000 volts, nominal, the high-voltage equipment shall be effectively separated from the space occupied by the low-voltage equipment by a suitable partition, fence, or screen.

(6) Grade, Floor, or Working Platform.

The grade, floor, or platform in the required working space in 110.26(A)(1), (A)(2), (A)(3), and (A)(5) shall be kept clear, and the floor, grade, or platform in the working space shall be as level and flat as practical.

Statement of Problem and Substantiation for Public Comment

This is being proposed in response to the public input that caused this text to be relocated in the first draft report. Moving this again and adding the informational note is proposed to deal with several issues I believe would be caused by moving this section from 110.26C2 (2020) to 110.26A2 (2023), as has been proposed. I am proposing moving this from 110.26A2 (where it was moved to in the first draft) to 110.26A1. Public Input No. 890-NFPA 70-2020 mentions the reason for the addition of this clause in 2020: The reason for the rule 110.26C2 (large equipment rules) seemed to be over concerns about a door to a piece of equipment entrapping a worker. The moving of this clause out of the large equipment rules section without the informational note; and the moving of it to to 110.26A2 (which deals with width of working space) I believe will introduce unintended difficulties due to known misinterpretations of the rules that persist and will be further reinforced by the relocation of the text.

There are two main issues I see with the moving of it to 110.26A2 the way it is written:

1. Problem with moving it to 110.26A2: It could support an interpretation of the NEC, that 2 @ 24" wide panelboards installed side by side in a 59" wide space, or the center panelboard of 3 panelboards installed side by side in an 89 inch space would be a violation, since when both doors are open the 30" space at one or both panelboards could be impeded. Reasons:
- There isn't consensus that the code was intended to ban the practice stated above, but it has been the opinion of some that it was the intent of the code. The relocating of this clause as written might further support this misinterpretation.
- Due to the width of most switchboard door bays in equipment that qualifies as "large equipment," the enforcement experience likely didn't deal much with whether the new 2020 language dealt with the scenario above, because most of these bays would be more than 30" on their own. Now, the language having moved could take on a new and possibly incorrect meaning.
- Due to the reason above, it is thought that the rule about open doors not impeding working space is more of a depth of working space issue rather than a width of working space issue. Thus, moving of this is requested.

2. Problem with moving it out of the "large equipment" rules section without the informational note: It could support an interpretation that a door for access to an equipment room being able to swing into the space while opening would be a violation, even in cases where it's a small panelboard or set of panelboards in a residential or light commercial application. This would require doubling off the space in many installations that might not allow other means like reversing swing or moving a door. Reasons:
- There isn't consensus that the code was intended to ban the practice stated above, but it has been the opinion of some that it was the intent of the code. A door to a closet having ability to swing into a working space has generally been considered a design issue and not an NEC issue. In some cases, the hazard caused by a equipment room door that can open into working space can be mitigated by other means than increasing the working space. The relocating of this clause without the informational note might further support the misinterpretation that a room door being able to swing into working space when opening violates the NEC.
- The potential for misinterpretation stated above is furthered by the fact that even though the NEC says open EQUIPMENT doors may not impede the working space, page 51 of the NEC handbook shows an example of an equipment room access door swinging into the working space as a violation of 110.26C2. Due to the requirement for panic hardware (and doors that swing outward) in most cases involving "large equipment," it is likely that enforcement experience dealing with the question of whether an access door swinging into the equipment room is a violation of 11026C2 doesn't exist. Now, the language having moved could take on a new and possibly incorrect meaning.
- Due to the reason stated above, it is my belief that the informational note is needed to clarify the intent of this rule.

In summary, it is my belief that the moving of this text to 110.26A2, and the doing of such without the proposed informational note will encourage interpretations of the code that go beyond the intent of its drafters. I believe the concern about worker entrapment by equipment doors is more of a depth of working space issue than it is a width of working space issue. As such, I propose moving it to 110.26A1 instead, along with the informational note. If the committee is unable to accept this proposed revision under concerns of it being "new material" than I would request that the section be stricken and moved back to where it was in 2020 (110.26C2).

Related Item

• First Revision No. 8635-NFPA 70-2021 [Section No. 110.26(A)(2)]

Submitter Information Verification

Submitter Full Name: Josh Weaver
Organization: Josh Weaver
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 05 13:10:20 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action:	Rejected but see related SR
Resolution:	SR-7801-NFPA 70-2021
Statement:	The requirement from First Draft Section 110.26(A)(2)(b) is relocated to 110.26 because it relates to more than just working space width. It has also been revised to clarify the condition caused by open equipment door(s) which would impede access to and egress from the working space.

Public Comment No. 1243-NFPA 70-2021 [Section No. 110.26(A)(1)]

(1) Depth of Working Space.

The depth of the working space in the direction of live parts shall not be less than that specified in Table 110.26(A)(1) unless the requirements of 110.26(A)(1)(a), (A)(1)(b), or (A)(1)(c) are met. Distances shall be measured from the exposed live parts or from the enclosure or opening if the live parts are enclosed. The depth of the working space shall be measured from the extended edge of an equipment door in its fully opened position in the direction of egress travel.

Table 110.26(A)(1) Working Spaces

Nominal Voltage to Ground	Minimum Clear Distance		
	Condition 1	Condition 2	Condition 3
0–150	900 mm (3 ft)	900 mm (3 ft)	900 mm (3 ft)
151–600	900 mm (3 ft)	1.0 m (3 ft 6 in.)	1.2 m (4 ft)
601–1000	900 mm (3 ft)	1.2 m (4 ft)	1.5 m (5 ft)

Note: Where the conditions are as follows:

Condition 1 — Exposed live parts on one side of the working space and no live or grounded parts on the other side of the working space, or exposed live parts on both sides of the working space that are effectively guarded by insulating materials.

Condition 2 — Exposed live parts on one side of the working space and grounded parts on the other side of the working space. Concrete, brick, or tile walls shall be considered as grounded.

Condition 3 — Exposed live parts on both sides of the working space.

(a) *Dead-Front Assemblies.* Working space shall not be required in the back or sides of assemblies, such as dead-front switchboards, switchgear, or motor control centers, where all connections and all renewable or adjustable parts, such as fuses or switches, are accessible from locations other than the back or sides. Where rear access is required to work on nonelectrical parts on the back of enclosed equipment, a minimum horizontal working space of 762 mm (30 in.) shall be provided.

(b) *Low Voltage.* By special permission, smaller working spaces shall be permitted where all exposed live parts operate at not greater than 30 volts rms, 42 volts peak, or 60 volts dc.

(c) *Existing Buildings.* In existing buildings where electrical equipment is being replaced, Condition 2 working clearance shall be permitted between dead-front switchboards, switchgear, enclosed panelboards, or motor control centers located across the aisle from each other where conditions of maintenance and supervision ensure that written procedures have been adopted to prohibit equipment on both sides of the aisle from being open at the same time and qualified persons who are authorized will service the installation.

Statement of Problem and Substantiation for Public Comment

This comment is directly related to, and modifies the application extent of, the additional text being added to 110.26(A)(2). That rule prohibits an open equipment door from impeding entry or exit from working space, without any clarification as to applicability. Consider any electrical installation, of whatever size, in a location that does not qualify for the double workspace depth covered in 110.26(C)(2)(b). The literal text of 110.26(A)(2) will now effectively prohibit all such conventional installations that use doors, because while open, such a door will obstruct egress as generally applied to 110.26(A) equipment. That is plainly excessive in instances where simple pressure opens the door to a full 180 degree position. The panel's efforts to address egress during a panic event are entirely appropriate; this comment attempts to avoid unintended consequences.

Related Item

• FR 8635

Submitter Information Verification

Submitter Full Name: Frederic Hartwell
Organization: Hartwell Electrical Services, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 11 11:32:12 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: The proposed revision conflicts with 110.26(A)(1), which requires minimum depth of clear working space to be measured from the exposed live parts or from the enclosure or opening if the live parts are enclosed for enclosed live parts.

Public Comment No. 1288-NFPA 70-2021 [Section No. 110.26(A)(2)]

(2) Width of Working Space.

The width of the working space in front of the electrical equipment shall be the width of the equipment or 762 mm (30 in.), whichever is greater. In all cases, the work space shall permit at least a 90 degree opening of equipment doors or hinged panels.

- ~~Open equipment doors shall not impede the entry to or egress from the working space.~~

Statement of Problem and Substantiation for Public Comment

Almost every installation is a violation of the proposed language. As soon as I open an equipment's door I have, through the definition of "impede," impeded my egress because I need to move around said door.

Related Item

• FR 8635

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Ryan Jackson
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 11 16:07:10 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7801-NFPA 70-2021
Statement: The requirement from First Draft Section 110.26(A)(2)(b) is relocated to 110.26 because it relates to more than just working space width. It has also been revised to clarify the condition caused by open equipment door(s) which would impede access to and egress from the working space.

Public Comment No. 609-NFPA 70-2021 [Section No. 110.26(A)(2)]

(2) Width of Working Space.

(a) The width of the working space in front of the electrical equipment shall be the width of the equipment or 762 mm (30 in.), whichever is greater. In all cases, the work space shall permit at least a 90 degree opening of equipment doors or hinged panels.

(b) Open equipment doors shall not impede the entry to or egress from the working space.

Additional Proposed Changes

File Name	Description	Approved
1_CN_108.pdf	70-CN108	

Statement of Problem and Substantiation for Public Comment

The following CC Note No. 108 appeared in the First Draft Report on First Revisions No. 8635 and No. 8681.

The Correlating Committee directs that FR 8635 and FR 8681 be reviewed for clarity. It is not clear if there are two pieces of equipment facing each other (condition 3), that open into the aisle, if it is required to be able to enter or egress from the aisle with both doors open simultaneously or if this can be addressed by work rules. This takes the large equipment rules for open doors and applies it to all equipment, except there is no dimension of the area required by 110.26(C)(1) and 110.33(A) unless there is large equipment.

Related Item

• First Revision No. 8635 • First Revision No. 8681

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 02 13:39:50 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7801-NFPA 70-2021
Statement: The requirement from First Draft Section 110.26(A)(2)(b) is relocated to 110.26 because it relates to more than just working space width. It has also been revised to clarify the condition caused by open equipment door(s) which would impede access to and egress from the working space.

Correlating Committee Note No. 108-NFPA 70-2021 [Section No. 110.26(A)(2)]

Submitter Information Verification

Committee: NEC-P01
Submittal Date: Tue May 04 12:25:31 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs that FR 8635 and FR 8681 be reviewed for clarity. It is not clear if there are two pieces of equipment facing each other (condition 3), that open into the aisle, if it is required to be able to enter or egress from the aisle with both doors open simultaneously or if this can be addressed by work rules. This takes the large equipment rules for open doors and applies it to all equipment, except there is no dimension of the area required by 110.26(C)(1) and 110.33(A) unless there is large equipment.

First Revision No. 8635-NFPA 70-2021 [Section No. 110.26(A)(2)]

First Revision No. 8681-NFPA 70-2021 [Section No. 110.33(A) [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. 870-NFPA 70-2021 [Section No. 110.26(A)(2)]

(2) Width of Working Space.

(a) The width of the working space in front of the electrical equipment shall be the width of the equipment or 762 mm (30 in.), whichever is greater. In all cases, the work space shall permit at least a 90 degree opening of equipment doors or hinged panels.

(b) ~~Open equipment doors shall not impede the entry to or egress from the working space.~~

Statement of Problem and Substantiation for Public Comment

Open equipment doors have nothing to do with the width of the working space so this requirement is misapplied. If anything, the open equipment doors, if they impeded entry to or egress from the equipment, could impact the depth of the working space as was done in the previous cycle for large equipment. In that case, though, the required space for entry/egress (24 in. wide by 6 1/2 ft. high) was clearly defined. In my opinion, if you're going to attempt to implement such a requirement for all equipment, you need to be much more thorough. We'd need to define the require entry/egress space, and we'd need to make some allowance for replacement of existing equipment or this is going to greatly impede such replacement in such locations where there isn't sufficient room for the potential additional depth required. Finally, we also need to define if this is only intended for a "Condition 1" or "Condition 2" installation or if you intended this to also apply in a "Condition 3" case when opposing equipment doors might be open at the same time. In my mind, the "Condition 3" possibility should be dealt with by safe work procedures and work permits and should not be considered in this case and I think the language selected should make this clear.

Related Item

• First Revision No. 8635

Submitter Information Verification

Submitter Full Name: Richard Holub
Organization: The DuPont Company, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 04 15:18:39 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7801-NFPA 70-2021
Statement: The requirement from First Draft Section 110.26(A)(2)(b) is relocated to 110.26 because it relates to more than just working space width. It has also been revised to clarify the condition caused by open equipment door(s) which would impede access to and egress from the working space.

Public Comment No. 1521-NFPA 70-2021 [Section No. 110.26(A)(4)]

(4) Limited Access.

Where equipment operating at 1000 volts, nominal, or less to ground and likely to require examination, adjustment, servicing, or maintenance while energized is required by installation instructions or function to be located in a space with limited access, all of the following shall apply:

(1) Where equipment is installed above a suspended ceiling (lay-in ~~ceiling~~ or solid surface) , there shall be an opening not smaller than 559 mm × 559 mm (22 in. × 22 in.), or in a crawl space, there shall be an accessible opening not smaller than 559 mm × 762 mm (22 in. × 30 in.).

(2) The width of the working space shall be the width of the equipment enclosure or a minimum of 762 mm (30 in.), whichever is greater.

(3) All enclosure doors or hinged panels shall be capable of opening a minimum of 90 degrees.

(4) The space in front of the enclosure shall comply with the depth requirements of Table 110.26(A)(1) and shall be unobstructed to the floor by fixed cabinets, walls, or partitions. Space reductions in accordance with 110.26(A)(1)(b) shall be permitted. The maximum height of the working space shall be the height necessary to install the equipment in the limited space. A horizontal ceiling structural member or access panel shall be permitted in this space provided the location of weight-bearing structural members does not result in a side reach of more than 150 mm (6 in.) to work within the enclosure.

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.

This comment will clarify which type(s) of suspended ceilings must comply with the dimensions of (1). Currently, the language only applies to lay-in ceilings. This simple clarification to FR 8637 in (1) would help AHJs to enforce the limited access requirements consistently for all types of suspended ceilings.

Related Item

• FR 8637

Submitter Information Verification

Submitter Full Name: Dean Hunter
Organization: Minnesota Department of Labor
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 16 09:46:57 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but held

Resolution: The submitter has proposed content that has not received public review. This PC does not comply with the Regulations Governing the Development of NFPA Standards, Section 4.4.4.2. Public comments must be related to material that has received public review.

Public Comment No. 617-NFPA 70-2021 [Section No. 110.26(A)(5)]

(5) Separation from High-Voltage Equipment.

Where switches, cutouts, or other equipment operating at 1000 volts, nominal, or less are installed in a vault, room, or enclosure where there are exposed live parts or exposed wiring operating over 1000 volts, nominal, the high-voltage equipment shall be effectively separated from the space occupied by the low-voltage equipment by a suitable partition, fence, or screen.

Additional Proposed Changes

File Name	Description	Approved
1_CN_109.pdf	70_CN109	

Statement of Problem and Substantiation for Public Comment

The following CC Note No. 109 appeared in the First Draft Report on First Revisions No. 8633.

The Correlating Committee directs that this first revision be rewritten to comply with the NEC Style Manual, Section 3.3.5 for parallel construction. The new language in 110.26(A)(6) needs to be correlated with the new wording in 110.34(A).

Related Item

• First Revision No. 8633

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 02 14:09:57 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7803-NFPA 70-2021
Statement: The wording in 110.26(A)(6) and 110.34(A) is revised to correlate with each other to comply with the NEC Style Manual, Section 3.3.5, Parallel Construction. Also, the references to other parts of 110.26(A) have been removed for clarity.

Correlating Committee Note No. 109-NFPA 70-2021 [New Section after 110.26(A)(5)]

Submitter Information Verification

Committee: NEC-P01
Submittal Date: Tue May 04 12:43:00 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs that this first revision be rewritten to comply with the NEC Style Manual, Section 3.3.5 for parallel construction. The new language in 110.26(A)(6) needs to be correlated with the new wording in 110.34(A).

First Revision No. 8633-NFPA 70-2021 [New Section after 110.26(A)(5)]

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. 1951-NFPA 70-2021 [Section No. 110.26(A)(6)]

~~**(6)** Grade, Floor, or Working Platform.~~

~~The grade, floor, or platform in the required working space in 110.26(A)(1), (A)(2), (A)(3), and (A)(5) shall be kept clear, and the floor, grade, or platform in the working space shall be as level and flat as practical.~~

Statement of Problem and Substantiation for Public Comment

FR-8633 added a new 110.26(A)(6). Public Input 402 would have been the better starting point for this change, which proposed to add the following requirement directly to 110.26(A).

"The required working space shall provide a floor, platform, grade or similar working surface that is as flat and level as practicable for the entire required depth and width of the working space."

The action taken by FR-8633 is awkward and references working space provided in 110.26(A)(3) and110.26(A)(5) which are not applicable. Only width and depth are applicable. If PI 402 would have been used as the basis for FR-8633, it would better align with the Panel action taken on FR-8712 in 110.34(A).

Related Item

• FR-8633 • PI-402

Submitter Information Verification

Submitter Full Name: Louis Barrios
Organization: Shell Global Solutions
Affiliation: American Chemistry Council
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 18 18:13:44 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7803-NFPA 70-2021
Statement: The wording in 110.26(A)(6) and 110.34(A) is revised to correlate with each other to comply with the NEC Style Manual, Section 3.3.5, Parallel Construction. Also, the references to other parts of 110.26(A) have been removed for clarity.

Public Comment No. 1289-NFPA 70-2021 [Section No. 110.26(B)]

~~**(B)** Clear Spaces.~~

~~Working space required by this section shall not be used for storage. When normally enclosed live parts are exposed for inspection or servicing, the working space, if in a passageway or general open space, shall be suitably guarded.~~

Statement of Problem and Substantiation for Public Comment

The first sentence can be removed if the first draft addition of 110.26(A)(6) continues to pass. The second sentence is important, but does not fall within the scope of the NEC. It describes safe work practices, not the installation of the equipment.

Related Item

• FR 8633

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Ryan Jackson
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 11 16:11:18 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: The submitter attempted to tie this proposed revision to First Revision No. 8633 which is unrelated to 110.26(B). Section 4.4.4 of the Regulations Governing the Development of NFPA Standards addresses content of Public Comments. This comment is not in compliance with what is required by these regulations.

Public Comment No. 1522-NFPA 70-2021 [Section No. 110.26(D)]

(D) Illumination.

~~Illumination~~ Adequate illumination shall be provided for all working spaces about service equipment, switchboards, switchgear, enclosed panelboards, or motor control centers installed indoors. Control by automatic means shall not be permitted to control all illumination within the working space. Additional lighting outlets shall not be required where the work space is illuminated by an adjacent light source or as permitted by 210.70(A)(1), Exception No. 1, for switched receptacles.

Informational Note: See OSHA Standard 1926.56 for minimum light levels.

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.

A portable lamp could be sufficient to provide this illumination. The current language would allow lighting from a switched receptacle (with a portable light) in accordance with 210.70(A)(1), Exception No. 1. Adjacent light source is not specific or easily defined or enforced. By providing a lighting level it would establish a minimum level of safety. The suggested informational note will help provide guidance as to what an adequate lighting level should be.

Related Item

• PI 2564 • PI 205 • PI 240

Submitter Information Verification

Submitter Full Name: Dean Hunter
Organization: Minnesota Department of Labor
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 16 10:00:01 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: Section 3.2.1 and Table 3.2.1 of the NEC Style Manual address references or requirements that are unenforceable or vague and state that the NEC shall not contain references or requirements that are unenforceable or vague. The term "adequate" is considered unenforceable or vague as proposed. The NEC Style Manual also addresses the use of informational notes in Section 3.1.3 which states, in part, that if an Informational note is needed to explain the text of the document, consideration should be given to rewriting the text of the document to make the rule clear. The rule is clear as written and does not justify the addition of the proposed informational note. The committee further notes that the suggested OSHA reference is only applicable to construction as it is located in Part 1926.

Public Comment No. 733-NFPA 70-2021 [Section No. 110.26(D)]

(D) Illumination.

Illumination of not less than 100 lux (10 footcandles) shall be provided for all working spaces about service equipment, switchboards, switchgear, enclosed panelboards, transfer switches, generators, emergency disconnects, or motor control centers ~~installed indoors~~ unless a different number is specified under illuminating engineering supervision . Control by automatic means shall not be permitted to control all illumination within the working space. Additional lighting outlets shall not be required where the work space is illuminated by an adjacent light source or as permitted by 210.70(A)(1), Exception No. 1, for switched receptacles.

Statement of Problem and Substantiation for Public Comment

When the code fails to specify a minimum, some installers are likely to skimp. Providing lighting that is inadequate does not create safety. Mr. Sasso's selection of a source for the proposed number appears reasonable. If an engineer acceptable to the AHJ says it's overmuch, the wording proposed in this comment allows for reduction. The 50 fc proposed by Mr. Capehart could be added, supplied by non-fixed, plug-in equipment.

Including outdoor locations and the other types of equipment is also warranted by the dangers, which might be lower or higher in a particular outdoor location compared to an indoor, and have no reason to somehow be absent when these other types of equipment need to be worked on or at least tested.

Local ordinances for light pollution or light level are unlikely to prohibit a worker turning on a 10 fc light, suitably shielded, for the duration of the activity. While the light cannot be automatically extinguished, there is nothing in this language to prohibit its operation by a manual switch, perhaps supplemented by a minimal light such as would be used to illuminated an exit. A temporary light stand operated from a generator or a vehicle battery, if necessary, is far more likely to be disturbing than an AHJ-approved permanent installation. Inspection authorities do take into account other local ordinances.

Related Item

• PI 240 • PI 205 • PI 2783

Submitter Information Verification

Submitter Full Name: David Shapiro
Organization: Safety First Electrical
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 03 14:24:18 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: The submitter has not included adequate technical substantiation as to why 10 foot-candles are appropriate for all working spaces. This PC does not comply with the Regulations Governing the Development of NFPA Standards, Section 4.4.4.3(d) Statement of the problem and substantiation for Public Comment.

Public Comment No. 1633-NFPA 70-2021 [Section No. 110.26(E)]

(E) Dedicated Equipment Space.

All service equipment, switchboards, switchgear, panelboards, and motor control centers shall be located in dedicated ~~spaces and protected from damage~~ space .

Exception: Control equipment that by its very nature or because of other rules of the Code must be adjacent to or within sight of its operating machinery shall be permitted in those locations.

(1) Indoor.

Indoor installations shall comply with 110.26(E)(1)(a) through (E)(1)(d).

(a) *Dedicated Electrical Space.* The space equal to the width and depth of the equipment and extending from the floor to a height of 1.8 m (6 ft) above the equipment or to the structural ceiling, whichever is lower, shall be dedicated to the electrical installation. No piping, ducts, leak protection apparatus, or other equipment foreign to the electrical installation shall be located in this zone.

Exception: Suspended ceilings with removable panels shall be permitted within the 1.8-m (6-ft) zone.

(b) *Foreign Systems.* The area above the dedicated space required by 110.26(E)(1)(a) shall be permitted to contain foreign systems, provided protection is installed to avoid damage to the electrical equipment from condensation, leaks, or breaks in such foreign systems.

(c) *Sprinkler Protection.* Sprinkler protection shall be permitted for the dedicated space where the piping complies with this section.

(d) *Suspended Ceilings.* A dropped, suspended, or similar ceiling that does not add strength to the building structure shall not be considered a structural ceiling.

(2) Outdoor.

Outdoor installations shall comply with 110.26(E)(2)(a) through (E)(2)(c).

(a) *Installation Requirements.* Outdoor electrical equipment shall be the following:

(2) Installed in identified enclosures

(3) Protected from accidental contact by unauthorized personnel or by vehicular traffic

(4) Protected from accidental spillage or leakage from piping systems

(e) *Work Space.* The working clearance space shall include the zone described in 110.26(A). No architectural appurtenance or other equipment shall be located in this zone.

(f) *Dedicated Equipment Space.* The space equal to the width and depth of the equipment, and extending from grade to a height of 1.8 m (6 ft) above the equipment, shall be dedicated to the electrical installation. No piping or other equipment foreign to the electrical installation shall be located in this zone.

Exception: Structural overhangs or roof extensions shall be permitted in this zone.

Statement of Problem and Substantiation for Public Comment

PI 3720 was resolved with the following statement: "The Panel concludes that the equipment dedicated space shall be protected from damage. This PI does not comply with the Regulations Governing the Development of NFPA Standards, Section 4.3.4.1(d) Statement of the problem and substantiation for Public Input."
First, the dedicated space does not require the protection. The equipment does. The subject of the sentence is not the dedicated space, it is the equipment that requires it. Because it is the equipment that requires the

protection, my PI was to delete that clause because the equipment ALREADY requires protection, via 110.27(B).
Statement of problem: The language marked for deletion is redundant.
Substantiation: Section 110.27(B) already requires this.
That is a statement of problem and a substantiation, in accordance with the regulations.

Related Item

• PI 3720

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Ryan Jackson
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 16 18:25:56 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: The rule is clear as written that the equipment, not the space, is required to be protected from damage. Specifically, all service equipment, switchboards, switchgear, panelboards, and motor control centers are required to be protected from damage.

Public Comment No. 11-NFPA 70-2021 [Section No. 110.26(E) [Excluding any Sub-Sections]]

All emergency disconnects required by 230.85, service equipment, switchboards, switchgear, panelboards, and motor control centers shall be located in dedicated spaces and protected from damage.

Exception: Control equipment that by its very nature or because of other rules of the Code must be adjacent to or within sight of its operating machinery shall be permitted in those locations.

Statement of Problem and Substantiation for Public Comment

Both the substantiation and the panel statement for adding the term "service equipment" referenced the disconnects required by 230.85. Those disconnects are not always the service equipment and if the intent is to require dedicated space for the emergency disconnect, the language needs to be expanded. Two of the 3 types of emergency disconnect include the words "NOT SERVICE EQUIPMENT" on the required label.

Related Item

• PI-596 • FR-8654

Submitter Information Verification

Submitter Full Name: Don Ganiere
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jun 29 12:18:08 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: The requirement is accurate as written without the need for a clarifying reference to a particular installation requirement as recommended by the submitter. The emergency disconnects in 230.85 do not necessarily have to contain fuses or circuit breakers. See Article 100 for the definition of service equipment.

Public Comment No. 1390-NFPA 70-2021 [Section No. 110.27(A)]

(A) Live Parts Guarded Against Accidental Contact.

Except as elsewhere required or permitted by this *Code,* live parts of electrical equipment operating at 50 to 1000 volts, nominal shall be guarded against accidental contact by approved enclosures or by any of the following means:

(1) By location in a room, vault, or similar enclosure that is accessible only to qualified persons.

(2) By permanent, substantial partitions or screens arranged so that only qualified persons have access to the space within reach of the live parts. Any openings in such partitions or screens shall be sized and located so that persons are not likely to come into accidental contact with the live parts or to bring conducting objects into contact with them.

(3) By location on a balcony, gallery, or platform elevated and arranged so as to exclude unqualified persons.

(4) By elevation above the floor or other working surface as follows:

(5) A minimum of 2.5 m (8 ft) for 50 volts to 300 volts between ungrounded conductors

(6) A minimum of 2.6 m (8 ft 6 in.) for 301 volts to 600 volts between ungrounded conductors

(7) A minimum of 2.62 m (8 ft 7 in.) for 601 volts to 1000 volts between ungrounded conductors

Informational Note: Considerations for testing for the absence of voltage should be made at the time of installation. If test points are insulated or not readily accessible due to the presence of barriers or guards, consider utilizing a permanently mounted absence of voltage tester (AVT). NFPA 70E provides guidance for safely verifying the absence of voltage.

Statement of Problem and Substantiation for Public Comment

With insulation and barrier requirements becoming more common, it is increasingly difficult in certain situations to safely test for the absence of voltage with a portable tester. NFPA 70E has recognized both portable testers and permanently mounted absence of voltage testers as acceptable methods for verifying the absence of voltage since 2018. Permanently mounted absence of voltage testers can significantly reduce risk and exposure to electrical hazards when testing for absence of voltage. However, because it is permanently mounted, the tester has to be considered during the installation of the equipment. Adding an informational note that encourages equipment designers and installers to consider how absence of voltage testing will be performed will lead to increased safety of those who operate and maintain the equipment after it is installed, regardless of whether portable or permanently-mounted testers are used. This informational note does not require absence of voltage testers, but only seeks to make people aware that there are multiple methods to accomplish this task and points the user of the standard to NFPA 70E for more information on this topic. If this topic is not considered at the time of installation, it may not be possible to mitigate testing risks later during the life of the equipment.

Related Item

• PI 3835 • FR 9522

Submitter Information Verification

Submitter Full Name: Rachel Bugaris
Organization: Panduit Corp
Street Address:
City:
State:
Zip:

Submittal Date: Thu Aug 12 14:11:41 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: Per 3.1.3, in part, of the NEC Style Manual, informational notes shall only be used where necessary to support or improve usability of the associated requirement. Informational notes shall not be written in mandatory language and shall not contain requirements, make interpretations, or make recommendations. If an informational note is needed to explain the text of the document, consideration should be given to rewriting the text of the document to make the rule clear. The rule is clear as written. Accordingly, an informational note is unnecessary. Further, per 90.1(A) in the 2020 NEC, in part, the Code “is not intended as a design specification...” Accordingly, it is inappropriate to add “an informational note that encourages equipment designers and installers to consider how absence of voltage testing will be performed” as the recommendation uses as substantiation for the proposed revision.

Public Comment No. 1996-NFPA 70-2021 [Section No. 110.27(C)]

(C) Warning Signs.

Entrances to rooms and other guarded locations that contain exposed live parts shall be marked with conspicuous warning signs forbidding unqualified persons to enter. The marking shall meet the requirements in 110.21(B).

Informational Note: For motors, see 430.232 and 430.233. For over 1000 volts, see 110.34.

Additional Proposed Changes

File Name	Description	Approved
CN_454.pdf	70_CN454	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 454 appeared in the First Draft Report.

The Correlating Committee directs that the Informational Note be rewritten to comply with the NEC Style Manual, Section 4.1.3 Reference Structure. The structure of the Informational Note needs to be revised.

Related Item

• Correlating Note No. 454

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 18 21:47:31 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7765-NFPA 70-2021
Statement: The informational note is removed as 110.27(C) pertains to warning signs and the three sections referenced in the informational note do not address warning signs.

Correlating Committee Note No. 454-NFPA 70-2021 [Section No. 110.27(C)]

Submitter Information Verification

Committee: NEC-AAC
Submittal Date: Mon May 10 22:04:53 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs that the Informational Note be rewritten to comply with the NEC Style Manual, Section 4.1.3 Reference Structure. The structure of the Informational Note needs to be revised.

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. 1528-NFPA 70-2021 [Section No. 110.28]

110.28 Enclosure Types.

Enclosures (other than surrounding fences or walls covered in 110.31) of switchboards, switchgear, enclosed panelboards, industrial control panels, motor control centers, meter sockets, enclosed switches, transfer switches, power outlets, circuit breakers, adjustable-speed drive systems, pullout switches, portable power distribution equipment, termination boxes, general-purpose transformers, fire pump controllers, fire pump motors, and motor controllers, rated not over 1000 volts nominal and intended for such locations, shall be marked with an ~~enclosure-type number~~ Enclosure Type number suitable for the application as shown in Table 110.28. Ingress protection (IP) ratings shall be permitted to be marked in addition to the Enclosure Type number but shall not substitute for the marked Enclosure Type number designations.

Table 110.28 shall be used for selecting these enclosures for use in specific ~~locations other than hazardous~~ (~~classified~~ unclassified) locations. The enclosures are not intended to protect against conditions such as condensation, icing, corrosion, or contamination that may occur within the enclosure or enter via the raceway or unsealed openings. Dusttight enclosures rated as Enclosure Types 3, 3S, 3SX, 3X, 4, 4X, 5, 6, 6P, 12, 12K and 13 shall be permitted for use in hazardous locations in accordance with 502.10(A)(3), 502.10(B)(4), 503.10(A)(2), and 506.15(C)(9). Dusttight enclosures rated as Enclosure Types 3, 3S, 3SX, 3X, 4, 4X, 5, 6, 6P, 12, 12K and 13 shall be permitted for use in unclassified locations and in Class II, Division 2: Class III and Zone 22 hazardous (classified) locations.

Table 110.28 Enclosure Selection

Provides a Degree of Protection Against the Following Environmental Conditions	For Outdoor Use									
	Enclosure Type Number									
	3	3R	3S	3X	3RX	3SX	4	4X	6	6P
Incidental contact with the enclosed equipment	X	X	X	X	X	X	X	X	X	X
Rain, snow, and sleet	X	X	X	X	X	X	X	X	X	X
Sleet*	—	—	X	—	—	X	—	—	—	—
Windblown dust	X	—	X	X	—	X	X	X	X	X
Hosedown	—	—	—	—	—	—	X	X	X	X
Corrosive agents	—	—	—	X	X	X	—	X	—	X
Temporary submersion	—	—	—	—	—	—	—	—	X	X
Prolonged submersion	—	—	—	—	—	—	—	—	—	X

Provides a Degree of Protection Against the Following Environmental Conditions	For Indoor Use									
	Enclosure Type Number									
	1	2	4	4X	5	6	6P	12	12K	13
Incidental contact with the enclosed equipment	X	X	X	X	X	X	X	X	X	X
Falling dirt	X	X	X	X	X	X	X	X	X	X
Falling liquids and light splashing	—	X	X	X	X	X	X	X	X	X
Circulating dust, lint, fibers, and flyings	—	—	X	X	—	X	X	X	X	X
Settling airborne dust, lint, fibers, and flyings	—	—	X	X	X	X	X	X	X	X
Hosedown and splashing water	—	—	X	X	—	X	X	—	—	—
Oil and coolant seepage	—	—	—	—	—	—	—	X	X	X
Oil or coolant spraying and splashing	—	—	—	—	—	—	—	—	—	X
Corrosive agents	—	—	—	X	—	—	X	—	—	—
Temporary submersion	—	—	—	—	—	X	X	—	—	—
Prolonged submersion	—	—	—	—	—	—	X	—	—	—

*The mechanism shall be operable when ice covered.

Informational Note No. 1: The term *raintight* is typically used in conjunction with Enclosure Types 3, 3S, 3SX, 3X, 4, 4X, 6, and 6P. The term *rainproof* is typically used in conjunction with Enclosure Types 3R and 3RX. The term *watertight* is typically used in conjunction with Enclosure Types 4, 4X, 6, and 6P. The term *driptight* is typically used in conjunction with Enclosure Types 2, 5, 12, 12K, and 13. The term *dusttight* is typically used in conjunction with Enclosure Types 3, 3S, 3SX, 3X, 4, 4X, 5, 6, 6P, 12, 12K, and 13.

Informational Note No. 2: See ANSI/IEC 60529, *Degrees of Protection Provided by Enclosures*, for ingress protection (IP) ratings. ~~IP ratings are not a substitute for enclosure type ratings.~~

Informational Note No. ~~3: Dusttight enclosures are suitable for use in hazardous locations in accordance with 502.10(A)(3), 502.10(B)(4), 503.10(A)(2), and 506.15(C)(9).~~

~~Informational Note No. 4: Dusttight enclosures are suitable for use in unclassified locations and in Class II, Division 2; Class III; and Zone 22 hazardous (classified) locations.~~

~~Informational Note No.~~ 5: Some ~~type 4X~~ enclosure type such as 12, 12K, or 13 enclosures may be marked ~~"indoor only."~~ with an Ancillary - XH for corrosive and hosedown capable indoor enclosure.

Informational Note No. 6: Some type 4, 4X, and 12 enclosures are ventilated. One way to determine applicable requirements for evaluating such enclosures is to refer to UL 508A, *Standard for Industrial Control Panels*.

Informational Note No. 7: For additional information, see NEMA 250, *Enclosures for Electrical Equipment (1000 Volts Maximum)*, for the description of the "Enclosure Type Rating: Ancillary — PW for Pressure Wash."

Statement of Problem and Substantiation for Public Comment

What is presently shown as Informational Note No. 2 to 110.28 has been at least in part a mandatory requirement to Table 110.28's Enclosure Types. Although designated as informational, the second sentence's wording is not written in informational language nor should it be. As such, its actual content is in violation of NEC® Style Manual 3.1.3 and its designation as an Informational Note effectively violates its intent and NEC® Style Manual 3.1.1. Keeping with its original intent, this statement is now integrated into the first paragraph of Section 110.28 as a requirement, in part permissive and in part mandatory in accordance with NEC® Style Manual 3.1.2 and 3.1.1.

Informational Notes 3 and 4 are actual references to mandatory requirements and represent permissive allowances, not informational suggestions, to use Enclosure Type ratings that are considered to be "dusttight" by a number of standards ANSI/NEMA Standard 250, ANSI/UL 50E, and Informational Note No 1 of 110.28 (or Table 110.28). As such, its actual content is in violation of NEC® Style Manual 3.1.3 and its designation as an Informational Note effectively violates its intent and NEC® Style Manual 3.1.1. Keeping with the mandatory and permissive requirements of these references, these requirements statements are now appended onto the second paragraph of Section 110.28 as permissive marking requirements in accordance with NEC® Style Manual 3.1.2.

Accordingly, Informational Note Numbers 3 and 4 are deleted due to the amendments to the second paragraph of Section 110.28, and any remaining Informational Notes are to be renumbered in accordance with NEC® Style Manual 2.4.3.

Related Item

• FR 8669

Submitter Information Verification

Submitter Full Name: Megan Hayes
Organization: Nema
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 16 10:57:09 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-7806-NFPA 70-2021 Informational Notes 2, 3, and 4 were not relocated to the proposed locations, as their relocations are not necessary.

Statement: Informational Notes No. 3, No. 6 and No. 7 are revised to comply with the NEC Style Manual, Section 4.1.3, Reference Structure.

Informational Note No. 2 is revised to comply with the NEC Style Manual, Section 3.1.3, as informational notes shall not be written in mandatory language and shall not make interpretations, or make recommendations.

Existing Informational Note No. 4 is unnecessary as it is incomplete with regards to hazardous location references and the appropriate references to hazardous locations are covered in Informational Note No. 3.

New informational Note No. 4 to refer to the new ancillary “-XH” marking.

Public Comment No. 1530-NFPA 70-2021 [Section No. 110.28]

110.28 Enclosure Types.

Enclosures (other than surrounding fences or walls covered in 110.31) of switchboards, switchgear, enclosed panelboards, industrial control panels, motor control centers, meter sockets, enclosed switches, transfer switches, power outlets, circuit breakers, adjustable-speed drive systems, pullout switches, portable power distribution equipment, termination boxes, general-purpose transformers, fire pump controllers, fire pump motors, and motor controllers, rated not over 1000 volts nominal and intended for such locations, shall be marked with an enclosure-type number as shown in Table 110.28.

Table 110.28 shall be used for selecting these enclosures for use in specific locations other than hazardous (classified) locations. The enclosures are not intended to protect against conditions such as condensation, icing, corrosion, or contamination that may occur within the enclosure or enter via the raceway or unsealed openings.

Table 110.28 Enclosure Selection

Provides a Degree of Protection Against the Following Environmental Conditions	For Outdoor Use									
	Enclosure Type Number									
	3	3R	3S	3X	3RX	3SX	4	4X	6	6P
Incidental contact with the enclosed equipment	X	X	X	X	X	X	X	X	X	X
Rain, snow, and sleet	X	X	X	X	X	X	X	X	X	X
Sleet*	—	—	X	—	—	X	—	—	—	—
Windblown dust	X	—	X	X	—	X	X	X	X	X
Hosedown	—	—	—	—	—	—	X	X	X	X
Corrosive agents	—	—	—	X	X	X	—	X	—	X
Temporary submersion	—	—	—	—	—	—	—	—	X	X
Prolonged submersion	—	—	—	—	—	—	—	—	—	X

Provides a Degree of Protection Against the Following Environmental Conditions	For Indoor Use									
	Enclosure Type Number									
	1	2	4	4X	5	6	6P	12	12K	13
Incidental contact with the enclosed equipment	X	X	X	X	X	X	X	X	X	X
Falling dirt	X	X	X	X	X	X	X	X	X	X
Falling liquids and light splashing	—	X	X	X	X	X	X	X	X	X
Circulating dust, lint, fibers, and flyings	—	—	X	X	—	X	X	X	X	X
Settling airborne dust, lint, fibers, and flyings	—	—	X	X	X	X	X	X	X	X
Hosedown and splashing water	—	—	X	X	—	X	X	—	—	—
Oil and coolant seepage	—	—	—	—	—	—	—	X	X	X
Oil or coolant spraying and splashing	—	—	—	—	—	—	—	—	—	X
Corrosive agents	—	—	—	X	—	—	X	—	—	—
Temporary submersion	—	—	—	—	—	X	X	—	—	—
Prolonged submersion	—	—	—	—	—	—	X	—	—	—

*The mechanism shall be operable when ice covered.

Informational Note No. 1: The term *raintight* is typically used in conjunction with Enclosure Types 3, 3S, 3SX, 3X, 4, 4X, 6, and 6P. The term *rainproof* is typically used in conjunction with Enclosure Types 3R and 3RX. The term *watertight* is typically used in conjunction with Enclosure Types 4, 4X, 6, and 6P. The term *driptight* is typically used in conjunction with Enclosure Types 2, 5, 12, 12K, and 13. The term *dusttight* is typically used in conjunction with Enclosure Types 3, 3S, 3SX, 3X, 4, 4X, 5, 6, 6P, 12, 12K, and 13.

Informational Note No. 2: See ANSI/IEC 60529, *Degrees of Protection Provided by Enclosures*, for ingress protection (IP) ratings. IP ratings are not a substitute for enclosure type ratings.

Informational Note No. 3: Dusttight enclosures are suitable for use in hazardous locations in accordance with 502.10(A)(3), 502.10(B)(4), 503.10(A)(2), and 506.15(C)(9).

Informational Note No. 4: Dusttight enclosures are suitable for use in unclassified locations and in Class II, Division 2; Class III; and Zone 22 hazardous (classified) locations.

Informational Note No. 5: Some ~~type 4X enclosures~~ enclosure types, such as 12, 12K, or

13 enclosures may be marked ~~"indoor only."~~ with an Ancillary-XH for corrosive and hosedown capable indoor enclosure.

Informational Note No. 6: Some type 4, 4X, and 12 enclosures are ventilated. One way to determine applicable requirements for evaluating such enclosures is to refer to UL 508A, *Standard for Industrial Control Panels*.

Informational Note No. 7: For additional information, see NEMA 250, *Enclosures for Electrical Equipment (1000 Volts Maximum)*, for the description of the "Enclosure Type Rating: Ancillary — PW for Pressure Wash."

Statement of Problem and Substantiation for Public Comment

Code Making Panel 1 needs to reconsider First Revision 8669 pertaining to the new Informational Note 5. Neither NEMA 250, Enclosures for Electrical Equipment (1000 Volts Maximum, or UL50E, Enclosures for Electrical Equipment, Environmental Considerations, recognizes the marking for a Type 4X "indoor only" enclosure. Currently NEMA 250 is being revised to add and Ancillary Rating "XH" to address indoor rated enclosure to be evaluated for both corrosive environments and protection for hosedown applications. Once NEMA 250 is published a proposal to UL50E will be submitted to add this ancillary rating.

Outdoor Type Ratings need to be restrictively reserved for enclosures approved for outdoor applications without exceptions.

Related Item

• FR 9357

Submitter Information Verification

Submitter Full Name: Megan Hayes
Organization: Nema
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 16 11:14:38 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-7806-NFPA 70-2021 Informational Notes 2, 3, and 4 were not relocated to the proposed locations, as their relocations are not necessary.

Statement: Informational Notes No. 3, No. 6 and No. 7 are revised to comply with the NEC Style Manual, Section 4.1.3, Reference Structure.

Informational Note No. 2 is revised to comply with the NEC Style Manual, Section 3.1.3, as informational notes shall not be written in mandatory language and shall not make interpretations, or make recommendations.

Existing Informational Note No. 4 is unnecessary as it is incomplete with regards to hazardous location references and the appropriate references to hazardous locations are covered in Informational Note No. 3.

New informational Note No. 4 to refer to the new ancillary "-XH" marking.

Public Comment No. 1676-NFPA 70-2021 [Section No. 110.28]

110.28 Enclosure Types.

Enclosures (other than surrounding fences or walls covered in 110.31) of switchboards, switchgear, enclosed panelboards, industrial control panels, motor control centers, meter sockets, enclosed switches, transfer switches, power outlets, circuit breakers, adjustable-speed drive systems, pullout switches, portable power distribution equipment, termination boxes, general-purpose transformers, fire pump controllers, fire pump motors, and motor controllers, rated not over 1000 volts nominal and intended for such locations, shall be marked with an enclosure-type number as shown in Table 110.28.

Table 110.28 shall be used for selecting these enclosures for use in specific locations other than hazardous (classified) locations. The enclosures are not intended to protect against conditions such as condensation, icing, corrosion, or contamination that may occur within the enclosure or enter via the raceway or unsealed openings.

Table 110.28 Enclosure Selection

Provides a Degree of Protection Against the Following Environmental Conditions	For Outdoor Use									
	Enclosure Type Number									
	3	3R	3S	3X	3RX	3SX	4	4X	6	6P
Incidental contact with the enclosed equipment	X	X	X	X	X	X	X	X	X	X
Rain, snow, and sleet	X	X	X	X	X	X	X	X	X	X
Sleet*	—	—	X	—	—	X	—	—	—	—
Windblown dust	X	—	X	X	—	X	X	X	X	X
Hosedown	—	—	—	—	—	—	X	X	X	X
Corrosive agents	—	—	—	X	X	X	—	X	—	X
Temporary submersion	—	—	—	—	—	—	—	—	X	X
Prolonged submersion	—	—	—	—	—	—	—	—	—	X

Provides a Degree of Protection Against the Following Environmental Conditions	For Indoor Use									
	Enclosure Type Number									
	1	2	4	4X	5	6	6P	12	12K	13
Incidental contact with the enclosed equipment	X	X	X	X	X	X	X	X	X	X
Falling dirt	X	X	X	X	X	X	X	X	X	X
Falling liquids and light splashing	—	X	X	X	X	X	X	X	X	X
Circulating dust, lint, fibers, and flyings	—	—	X	X	—	X	X	X	X	X
Settling airborne dust, lint, fibers, and flyings	—	—	X	X	X	X	X	X	X	X
Hosedown and splashing water	—	—	X	X	—	X	X	—	—	—
Oil and coolant seepage	—	—	—	—	—	—	—	X	X	X
Oil or coolant spraying and splashing	—	—	—	—	—	—	—	—	—	X
Corrosive agents	—	—	—	X	—	—	X	—	—	—
Temporary submersion	—	—	—	—	—	X	X	—	—	—
Prolonged submersion	—	—	—	—	—	—	X	—	—	—

*The mechanism shall be operable when ice covered.

Informational Note No. 1: The term *raintight* is typically used in conjunction with Enclosure Types 3, 3S, 3SX, 3X, 4, 4X, 6, and 6P. The term *rainproof* is typically used in conjunction with Enclosure Types 3R and 3RX. The term *watertight* is typically used in conjunction with Enclosure Types 4, 4X, 6, and 6P. The term *driptight* is typically used in conjunction with Enclosure Types 2, 5, 12, 12K, and 13. The term *dusttight* is typically used in conjunction with Enclosure Types 3, 3S, 3SX, 3X, 4, 4X, 5, 6, 6P, 12, 12K, and 13.

Informational Note No. 2: See ANSI/IEC 60529, *Degrees of Protection Provided by Enclosures*, for ingress protection (IP) ratings. IP ratings are not a substitute for enclosure type ratings.

Informational Note No. 3: Dusttight enclosures are suitable for use in hazardous locations in accordance with 502.10(A)(3), 502.10(B)(4), 503.10(A)(2), and 506.15(C)(9).

Informational Note No. 4: Dusttight enclosures are suitable for use in unclassified locations and in Class II, Division 2; Class III; and Zone 22 hazardous (classified) locations.

Informational Note No. 5: Some type 4X enclosures may be marked “indoor only.”

Informational Note No. 6: Some type 4, 4X, and 12 enclosures are ventilated. One way to determine applicable requirements for evaluating such enclosures is to refer to UL 508A, *Standard for Industrial Control Panels*.

Informational Note No. 7: For additional information, see NEMA 250, *Enclosures for Electrical Equipment (1000 Volts Maximum)*, for the description of the “Enclosure Type Rating: Ancillary — PW for Pressure Wash.”

Additional Proposed Changes

File Name	Description	Approved
110.28_Enclosures_Comment_-_complete.docx	110.28 Public Comment	

Statement of Problem and Substantiation for Public Comment

Informational Note 4 is unnecessary and was deleted, as it is incomplete with regards to hazardous location references. The appropriate references to hazardous locations are covered in Informational Note 3. The other Informational Notes were renumbered as a result of Informational Note 4 being deleted.

Related Item

• FR 8669

Submitter Information Verification

Submitter Full Name: Kenneth McKinney
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 17 10:18:43 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-7806-NFPA 70-2021 Informational Notes 2, 3, and 4 were not relocated to the proposed locations, as their relocations are not necessary.

Statement: Informational Notes No. 3, No. 6 and No. 7 are revised to comply with the NEC Style Manual, Section 4.1.3, Reference Structure.

Informational Note No. 2 is revised to comply with the NEC Style Manual, Section 3.1.3, as informational notes shall not be written in mandatory language and shall not make interpretations, or make recommendations.

Existing Informational Note No. 4 is unnecessary as it is incomplete with regards to hazardous location references and the appropriate references to hazardous locations are covered in Informational Note No. 3.

New informational Note No. 4 to refer to the new ancillary “-XH” marking.

Comment for 110.28 – Enclosure Types

~~Informational Note No. 4: Dusttight enclosures are suitable for use in unclassified locations and in Class II, Division 2; Class III; and Zone 22 hazardous (classified) locations.~~

Informational Note No. ~~5~~ 4: Some type 4X enclosures may be marked “indoor only”.

Informational Note No. ~~6~~ 5: Some type 4, 4X, and 12 enclosures are ventilated. One way to determine applicable requirements for evaluating such enclosures is to refer to UL 508A, *Standard for Industrial Control Panels*.

Informational Note No. ~~7~~ 6: For additional information, see NEMA 250, *Enclosures for Electrical Equipment (1000 Volts Maximum)*, for the description of the “Enclosure Type Rating: Ancillary – PW for Pressure Wash.”

Public Comment No. 621-NFPA 70-2021 [Section No. 110.28]

110.28 Enclosure Types.

Enclosures (other than surrounding fences or walls covered in 110.31) of switchboards, switchgear, enclosed panelboards, industrial control panels, motor control centers, meter sockets, enclosed switches, transfer switches, power outlets, circuit breakers, adjustable-speed drive systems, pullout switches, portable power distribution equipment, termination boxes, general-purpose transformers, fire pump controllers, fire pump motors, and motor controllers, rated not over 1000 volts nominal and intended for such locations, shall be marked with an enclosure-type number as shown in Table 110.28.

Table 110.28 shall be used for selecting these enclosures for use in specific locations other than hazardous (classified) locations. The enclosures are not intended to protect against conditions such as condensation, icing, corrosion, or contamination that may occur within the enclosure or enter via the raceway or unsealed openings.

Table 110.28 Enclosure Selection

Provides a Degree of Protection Against the Following Environmental Conditions	For Outdoor Use									
	Enclosure Type Number									
	3	3R	3S	3X	3RX	3SX	4	4X	6	6P
Incidental contact with the enclosed equipment	X	X	X	X	X	X	X	X	X	X
Rain, snow, and sleet	X	X	X	X	X	X	X	X	X	X
Sleet*	—	—	X	—	—	X	—	—	—	—
Windblown dust	X	—	X	X	—	X	X	X	X	X
Hosedown	—	—	—	—	—	—	X	X	X	X
Corrosive agents	—	—	—	X	X	X	—	X	—	X
Temporary submersion	—	—	—	—	—	—	—	—	X	X
Prolonged submersion	—	—	—	—	—	—	—	—	—	X

Provides a Degree of Protection Against the Following Environmental Conditions	For Indoor Use									
	Enclosure Type Number									
	1	2	4	4X	5	6	6P	12	12K	13
Incidental contact with the enclosed equipment	X	X	X	X	X	X	X	X	X	X
Falling dirt	X	X	X	X	X	X	X	X	X	X
Falling liquids and light splashing	—	X	X	X	X	X	X	X	X	X
Circulating dust, lint, fibers, and flyings	—	—	X	X	—	X	X	X	X	X
Settling airborne dust, lint, fibers, and flyings	—	—	X	X	X	X	X	X	X	X
Hosedown and splashing water	—	—	X	X	—	X	X	—	—	—
Oil and coolant seepage	—	—	—	—	—	—	—	X	X	X
Oil or coolant spraying and splashing	—	—	—	—	—	—	—	—	—	X
Corrosive agents	—	—	—	X	—	—	X	—	—	—
Temporary submersion	—	—	—	—	—	X	X	—	—	—
Prolonged submersion	—	—	—	—	—	—	X	—	—	—

*The mechanism shall be operable when ice covered.

Informational Note No. 1: The term *raintight* is typically used in conjunction with Enclosure Types 3, 3S, 3SX, 3X, 4, 4X, 6, and 6P. The term *rainproof* is typically used in conjunction with Enclosure Types 3R and 3RX. The term *watertight* is typically used in conjunction with Enclosure Types 4, 4X, 6, and 6P. The term *driptight* is typically used in conjunction with Enclosure Types 2, 5, 12, 12K, and 13. The term *dusttight* is typically used in conjunction with Enclosure Types 3, 3S, 3SX, 3X, 4, 4X, 5, 6, 6P, 12, 12K, and 13.

Informational Note No. 2: See ANSI/IEC 60529, *Degrees of Protection Provided by Enclosures*, for ingress protection (IP) ratings. IP ratings are not a substitute for enclosure type ratings.

Informational Note No. 3: Dusttight enclosures are suitable for use in hazardous locations in accordance with 502.10(A)(3), 502.10(B)(4), 503.10(A)(2), and 506.15(C)(9).

Informational Note No. 4: Dusttight enclosures are suitable for use in unclassified locations and in Class II, Division 2; Class III; and Zone 22 hazardous (classified) locations.

Informational Note No. 5: Some type 4X enclosures may be marked “indoor only.”

Informational Note No. 6: Some type 4, 4X, and 12 enclosures are ventilated. One way to determine applicable requirements for evaluating such enclosures is to refer to UL 508A, *Standard for Industrial Control Panels*.

Informational Note No. 7: For additional information, see NEMA 250, *Enclosures for Electrical Equipment (1000 Volts Maximum)*, for the description of the “Enclosure Type Rating: Ancillary — PW for Pressure Wash.”

Additional Proposed Changes

File Name	Description	Approved
1_CN_110.pdf	70_CN110	

Statement of Problem and Substantiation for Public Comment

The following CC Note No. 110 appeared in the First Draft Report on First Revisions No. 8669.

The Correlating Committee directs that FR 8669 be rewritten to comply with the NEC Style Manual, Section 4.1.3 Reference Structure. Informational Notes 3, 6 and 7 need to be revised to comply with the NEC Style Manual.
The Correlating Committee also directs this First Revision be referred to CMP-14 for information.

Related Item

• First Revision No. 8669

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 02 14:19:40 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-7806-NFPA 70-2021 Informational Notes 2, 3, and 4 were not relocated to the proposed locations, as their relocations are not necessary.

Statement: Informational Notes No. 3, No. 6 and No. 7 are revised to comply with the NEC Style Manual, Section 4.1.3, Reference Structure.

Informational Note No. 2 is revised to comply with the NEC Style Manual, Section 3.1.3, as informational notes shall not be written in mandatory language and shall not make interpretations, or make recommendations.

Existing Informational Note No. 4 is unnecessary as it is incomplete with regards to hazardous location references and the appropriate references to hazardous locations are covered in Informational Note No. 3.

New informational Note No. 4 to refer to the new ancillary “-XH” marking.

Correlating Committee Note No. 110-NFPA 70-2021 [Section No. 110.28]

Submitter Information Verification

Committee: NEC-P01
Submittal Date: Tue May 04 12:46:36 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs that FR 8669 be rewritten to comply with the NEC Style Manual, Section 4.1.3 Reference Structure. Informational Notes 3, 6 and 7 need to be revised to comply with the NEC Style Manual.

The Correlating Committee also directs this First Revision be referred to CMP-14 for information.

First Revision No. 8669-NFPA 70-2021 [Section No. 110.28]

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. 1952-NFPA 70-2021 [Section No. 110.31 [Excluding any Sub-Sections]]

Electrical installations in a vault, room, or closet or in an area surrounded by a wall, screen, or fence, access to which is controlled by a lock(s) or other approved means, shall be considered to be accessible to qualified persons only. The type of enclosure used in a given case shall be designed and constructed according to the nature and degree of the hazard(s) associated with the installation.

For installations other than equipment as described in 110.31(D), a wall, screen, or fence shall be used to enclose an outdoor electrical installation to deter access by persons who are not qualified. A fence shall not be less than 2.1 m (7 ft) in height or a combination of 1.8 m (6 ft) or more of fence fabric and a 300 mm (1 ft) or more extension utilizing three or more strands of barbed wire or equivalent. The distance from the fence to live parts shall be not less than given in Table 110.31.

Table 110.31 Minimum Distance from Fence to Live Parts

	Minimum Distance to Live Parts	
Nominal Voltage	m	ft
1001–13,799	3.05	10
13,800–230,000	4.57	15
Over 230,000	5.49	18

Note: For clearances of conductors for specific system voltages and typical BIL ratings, see ANSI/IEEE C2-2017, *National Electrical Safety Code.*

~~Informational Note No. 1: See ANSI/IEEE C2-2017, *National Electrical Safety Code* , for clearances of conductors for specific system voltages and typical BIL ratings.~~

~~Informational Note No. 2: See Part III of Article 450 for construction requirements for transformer vaults.~~

Statement of Problem and Substantiation for Public Comment

FR-8367 modified Informational Notes 1 and 2 for NEC Style Manual changes.
The correct action should have been to delete both Informational Notes 1 and 2.
Informational Note 1 is redundant to the existing Note to Table 110.31.
Informational Note 2 is redundant to the reference to Part III of Article 450 already provided in 110.31(A)(5).

Related Item

• FR-8367

Submitter Information Verification

Submitter Full Name: Louis Barrios
Organization: Shell Global Solutions
Affiliation: American Chemistry Council
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 18 18:26:53 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action:	Rejected but see related SR
Resolution:	SR-7809-NFPA 70-2021
Statement:	The existing Note in Table 110.31 is removed due to redundancy with existing Informational Note No. 1 and because notes to the tables are enforceable. Informational Note No. 2 is removed due to the redundancy with the wording in 110.31(A)(5).

Public Comment No. 1247-NFPA 70-2021 [Section No. 110.32]

110.32 Work Space About Equipment.

Sufficient space shall be provided and maintained about electrical equipment to permit ready and safe operation and maintenance of such equipment. Where energized parts are exposed, the minimum clear work space shall be not less than 2.0 m (6½ ft) high (measured vertically from the floor or platform) and the width of the equipment or 914 mm (3 ft) wide (measured parallel to the equipment), whichever is greater. The depth shall be as required in 110.34(A). In all cases, the work space shall permit at least a 90-degree opening of doors or hinged panels.The depth of the working space shall be measured from the extended edge of an equipment door in its fully opened position in the direction of egress travel. Within the height requirements of this section, other equipment that is associated with the electrical installation and is located above or below the electrical equipment shall be permitted to extend not more than 150 mm (6 in.) beyond the front of the electrical equipment. Working space required by this section shall not be used for storage. When normally enclosed live parts are exposed for inspection or servicing, the working space, if in a passageway or general open space, shall be suitably guarded.

Statement of Problem and Substantiation for Public Comment

This comment is directly related to, and modifies the application extent of, the additional text being added to 110.33(A). That rule prohibits an open equipment door from impeding entry or exit from working space, without any clarification as to applicability. Consider any electrical installation, of whatever size, in a location that does not qualify for the double workspace depth covered in 110.33(A)(1)(b). The literal text of 110.33(A) will now effectively prohibit all such conventional installations that use doors, because while open, such a door will obstruct egress as generally applied to 110.33(A) equipment. That is plainly excessive in instances where simple pressure opens the door to a full 180 degree position. The panel's efforts to address egress during a panic event are entirely appropriate; this comment attempts to avoid unintended consequences.

Related Item

• FR-8681

Submitter Information Verification

Submitter Full Name: Frederic Hartwell
Organization: Hartwell Electrical Services, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 11 12:13:23 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: The proposed revision conflicts with 110.34(A), which requires minimum depth of clear working space to be measured from the live parts, if such are exposed, or from the enclosure front or opening if such are enclosed.

Public Comment No. 624-NFPA 70-2021 [Section No. 110.34(A)]

(A) Working Space.

Except as elsewhere required or permitted in this *Code,* equipment likely to require examination, adjustment, servicing, or maintenance while energized shall have clear working space in the direction of access to live parts of the electrical equipment and shall be not less than specified in Table 110.34(A). Distances shall be measured from the live parts, if such are exposed, or from the enclosure front or opening if such are enclosed. The required working space shall provide a floor, platform, grade, or similar working surface that is as flat and level as practicable for the entire depth and width of the working space.

Exception: Working space shall not be required in back of equipment such as switchgear or control assemblies where there are no renewable or adjustable parts (such as fuses or switches) on the back and where all connections are accessible from locations other than the back. Where rear access is required to work on nonelectrical parts on the back of enclosed equipment, a minimum working space of 762 mm (30 in.) horizontally shall be provided.

Table 110.34(A) Minimum Depth of Clear Working Space at Electrical Equipment

Nominal Voltage to Ground	Minimum Clear Distance		
	Condition 1	Condition 2	Condition 3
1001–2500 V	900 mm (3 ft)	1.2 m (4 ft)	1.5 m (5 ft)
2501–9000 V	1.2 m (4 ft)	1.5 m (5 ft)	1.8 m (6 ft)
9001–25,000 V	1.5 m (5 ft)	1.8 m (6 ft)	2.8 m (9 ft)
25,001 V–75 kV	1.8 m (6 ft)	2.5 m (8 ft)	3.0 m (10 ft)
Above 75 kV	2.5 m (8 ft)	3.0 m (10 ft)	3.7 m (12 ft)

Note: Where the conditions are as follows:

Condition 1 — Exposed live parts on one side of the working space and no live or grounded parts on the other side of the working space, or exposed live parts on both sides of the working space that are effectively guarded by insulating materials.

Condition 2 — Exposed live parts on one side of the working space and grounded parts on the other side of the working space. Concrete, brick, or tile walls shall be considered as grounded.

Condition 3 — Exposed live parts on both sides of the working space.

Additional Proposed Changes

File Name	Description	Approved
1_CN_111.pdf	70_CN111	

Statement of Problem and Substantiation for Public Comment

The following CC Note No. 111 appeared in the First Draft Report on First Revision No. 8712.

The Correlating Committee directs that FR 8712 be rewritten to comply with the NEC Style Manual, Section 3.3.5 for parallel construction. The new language in 110.26(A)(6) needs to be correlated with the new wording in 110.34(A).

Related Item

• First Revision No. 8712

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 02 14:24:59 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7811-NFPA 70-2021
Statement: The wording in this section is revised to correlate with the new language in 110.26(A)(6) to comply with the NEC Style Manual, Section 3.3.5, Parallel Construction.

Correlating Committee Note No. 111-NFPA 70-2021 [Section No. 110.34(A)]

Submitter Information Verification

Committee: NEC-P01
Submittal Date: Tue May 04 12:57:35 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs that FR 8712 be rewritten to comply with the NEC Style Manual, Section 3.3.5 for parallel construction. The new language in 110.26(A)(6) needs to be correlated with the new wording in 110.34(A).

First Revision No. 8712-NFPA 70-2021 [Section No. 110.34(A)]

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. 195-NFPA 70-2021 [Section No. 110.40]

110.40 Temperature Limitations at Terminations.

Conductors shall be permitted to be terminated based on the 90°C (194°F) temperature rating and ampacity as given in Table 315.60(C)(1) through Table 315.60(C)(20), unless otherwise identified.

Informational Note: Equipment markings, including terminal temperature ratings, are independent of the circuit conductors. Terminal temperatures are based on product standards and are part of the rating and listing of the equipment. Temperature adjustments or correction factors applied to the circuit conductors does not impact the temperature rating of the equipment or its terminal(s).

Statement of Problem and Substantiation for Public Comment

The panel statement provided on the PI 95 provided much needed clarity on the problem encountered in the field when circuit conductors are adjusted for ambient temperature or other correction factors. The shortened version of the resolution included with this public comment would provide clarity to those that are not involved with the Code process and are not aware of the panel statement. I thank CMP 1 for the clarification on this issue.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 194-NFPA 70-2021 [Section No. 110.14(C) [Excluding any Sub-Sections]]	Terminal temperature ratings

Related Item

- PI 95

Submitter Information Verification

Submitter Full Name: Paul Guidry
Organization: Fluor Enterprises, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Sat Jul 10 23:15:08 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected

Resolution: The proposed informational note does not add clarity to the Code. Per 3.1.3 of the NEC Style Manual, informational notes shall only be used where necessary to support or improve usability of the associated requirement. If an Informational note is needed to explain the text of the document, consideration should be given to rewriting the text of the document to make the rule clear.

Public Comment No. 411-NFPA 70-2021 [New Section after A.1]

Annex B

Article	Standard Number	Standard Title
110	UL 9691	Recommended Practice for Nameplates for Use in Electrical Installations

Statement of Problem and Substantiation for Public Comment

The Code nor product standards provide uniform recommendations for information required on equipment nameplates. They also do not include guidance for determining what sufficient durability is for markings or labels for harsh environments. UL 9691 Recommended Practice for Nameplates Used in Electrical Installations provides additional guidance for nameplate markings required by the Code and product standards.

Related Item

• Public Input No. 1777

Submitter Information Verification

Submitter Full Name: Charles Mercier
Organization: Underwriters Laboratories Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jul 27 08:56:11 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7541-NFPA 70-2021
Statement: The annex is revised to reference current safety standards. Part 2 has been added to address product safety standards for conductors and equipment that do not have an associated listing requirement

Public Comment No. 1262-NFPA 70-2021 [Section No. A.1]

A.1

Article	Standard Number	Standard Title	
110	UL 10C	Positive Pressure Fire Tests of Door Assemblies	
	-	UL 305	Panic Hardware
	-	UL 486D	Sealed Wire Connector Systems
	-	UL 2043	Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces
	-	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
210	UL 935	Fluorescent-Lamp Ballasts	
	-	UL 943	Ground Fault Circuit Interrupters
	-	UL 1029	High-Intensity-Discharge Lamp Ballast
	-	UL 1699	Arc-Fault Circuit-Interrupters
225	UL 6	Electrical Rigid Metal Conduit — Steel	
	-	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	-	UL 360	Liquid-Tight Flexible Metal Conduit
	-	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	-	UL 1242	Electrical Intermediate Metal Conduit — Steel
	-	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	-	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
230	UL 6	Electrical Rigid Metal Conduit — Steel	
	-	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	-	UL 67	Panelboards
	-	UL 98	Enclosed and Dead-Front Switches
	-	UL 218	Fire Pump Controllers
	-	UL 231	Power Outlets

Article	Standard Number	Standard Title	
-		UL 347	Medium-Voltage AC Contactors, Controllers, and Control Centers
-		UL 360	Liquid-Tight Flexible Metal Conduit
-		UL 414	Meter Sockets
-		UL 486A-486B	Wire Connectors
-		UL 486C	Splicing Wire Connectors
-		UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
-		UL 508	Industrial Control Equipment
-		UL 508A	Industrial Control Panels
-		UL 514B	Conduit, Tubing and Cable Fittings
-		UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
-		UL 845	Motor Control Centers
-		UL 857	Busways
-		UL 869A	Reference Standard for Service Equipment
-		UL 891	Switchboards
-		UL 891A	Switchboards Rated 601–1000 V
-		UL 977	Fused Power-Circuit Devices
-		UL 1008	Transfer Switch Equipment
-		UL 1008A	Transfer Switch Equipment, Over 1000 Volts
-		UL 1008M	Meter-Mounted Transfer Switches
-		UL 1008S	Solid-State Transfer Switches
-		UL 1053	Ground-Fault Sensing and Relaying Equipment
-		UL 1062	Unit Substations
-		UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
-		UL 1242	Electrical Intermediate Metal Conduit — Steel
-		UL 1429	Pullout Switches
-		UL 1449	Surge Protective Devices
-		UL 1558	Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear
-		UL 1660	Liquid-Tight Flexible Nonmetallic Conduit

Article	Standard Number	Standard Title	
	-	UL 1740	Robots and Robotic Equipment
	-	UL 1953	Outline for Power Distribution Blocks
-	-	-	
	-	UL 2011	Outline for Machinery
	-	UL 2200	Stationary Engine Generator Assemblies
	-	UL 2416	Audio/Video, Information and Communication Technology Equipment Cabinet, Enclosure and Rack Systems
	-	UL 2446	Outline for Unitary Boiler Room Systems
	-	UL 2565	Industrial Metalworking and Woodworking Machine Tools
	-	UL 2735	Electric Utility Meters
	-	UL 2745	Outline for Meter Socket Adapters for Communications Equipment
	-	UL 2876	Outline for Remote Racking Devices for Switchgear and Controlgear
	-	UL 4248-1	Fuseholders — Part 1: General Requirements
	-	UL 60947-1	Low-Voltage Switchgear and Controlgear — Part 1: General Rules
	-	UL 61800-5-1	Adjustable Speed Electrical Power Drive Systems — Part 5-1: Safety Requirements — Electrical, Thermal and Energy
240	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures	
	-	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
250	UL 467	Grounding and Bonding Equipment	
300	UL 44	Thermoset-Insulated Wires and Cables	
	-	UL 83	Thermoplastic-Insulated Wires and Cables
	-	UL 83A	Fluoropolymer Insulated Wire
-	-	-	

Article	Standard Number	Standard Title	
	-	UL 263	Fire Tests of Building Construction and Materials
	-	UL 756C	Polymeric Materials — Use in Electrical Equipment Evaluations
	-	UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords
	-	UL 2556	Standard for Wire and Cable Test Methods
	-	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
310	UL 44	Thermoset-Insulated Wires and Cables	
	-	UL 83	Thermoplastic-Insulated Wires and Cables
	-	UL 83A	Fluoropolymer Insulated Wire
-	-	-	
	-	UL 224	Extruded Insulating Tubing
	-	UL 1063	Machine-Tool Wires and Cables
	-	UL 1441	Coated Electrical Sleeving
311	ANSI C119.4	Electric Connectors — Connectors for Use between Aluminum-to-Aluminum and Aluminum-to-Copper Conductors Designed for Normal Operation at or Below 93ºC and Copper-to-Copper Conductors Designed for Normal Operation at or Below 100ºC	
	-	IEEE 48	IEEE Standard for Test Procedures and Requirements for Alternating-Current Cable Terminations Used on Shielded Cables Having Laminated Insulation Rated 2.5kV through 765 kV or Extruded Insulation Rated 2.5 kV through 500 kV
	-	IEEE 386	IEEE Standard for Separable Insulated Connector Systems for Power Distribution Systems Rated 2.5 kV through 35 kV
	-	IEEE 404	IEEE Standard for Extruded and Laminated Dielectric Shielded Cable Joints Rated 2.5 kV to 500 kV

Article	Standard Number	Standard Title	
	-	UL 1072	Medium Voltage Power Cables
312	UL 50	Enclosures for Electrical Equipment	
	-	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	-	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
314	UL 50	Enclosures for Electrical Equipment	
	-	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	-	UL 486D	Sealed Wire Connector Systems
	-	UL 498	Attachment Plugs and Receptacles
	-	UL 498B	Outline for Receptacles with Integral Switching Means
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection
	-	UL 514A	Metallic Outlet Boxes
	-	UL 514B	Conduit, Tubing, and Cable Fittings
	-	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	-	UL 514D	Cover Plates for Flush-Mounted Wiring Devices
	-	UL 1953	Power Distribution Blocks
320	UL 4	Armored Cable	
322	NEMA Publication No. UC2	Under-carpet Power Distribution Systems	
324	NEMA Publication No. UC2	Under-carpet Power Distribution Systems	
330	UL 1569	Metal-Clad Cables	
	-	UL 2225	Cables and Cable-Fittings For Use In Hazardous (Classified) Locations
332	UL 504	Outline for Mineral-Insulated, Metal-Sheathed Cable	

Article	Standard Number	Standard Title	
334	UL 719	Nonmetallic-Sheathed Cables	
	-	UL Subject 2256	Nonmetallic Sheathed Cable Interconnects
336	UL 1277	Electrical Power and Control Tray Cables with Optional Optical-Fiber Members	
337	UL 1309A	Cable for Use in Mobile Installations	
338	UL 854	Service-Entrance Cables	
340	UL 493	Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables	
341	-	-	
342	UL 1242	Electrical Intermediate Metal Conduit — Steel	
344	UL 6	Electrical Rigid Metal Conduit — Steel	
	-	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
348	UL 1	Flexible Metal Conduit	
	-	UL 62275	Cable Management Systems -- Cable Ties for Electrical Installation
350	UL 360	Liquid-Tight Flexible Steel Conduit	
	-	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
352	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings	
353	UL 651A	Schedule 40 and 80 High Density Polyethylene (HDPE) Conduit	
354	UL 1990	Nonmetallic Underground Conduit with Conductors	
355	UL 2420	Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings	
	-	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings

Article	Standard Number	Standard Title	
	-	UL 2515A	Supplemental Requirements for Extra-Heavy Wall Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
356	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit	
	-	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
358	UL 797	Electrical Metallic Tubing — Steel	
	-	UL 797A	Electrical Metallic Tubing — Aluminum
360	UL Subject 1652	Flexible Metallic Tubing	
362	UL 1653	Electrical Nonmetallic Tubing	
	-	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
366	UL 870	Wireways, Auxiliary Gutters, and Associated Fittings	
370	ANSI/CSA C22.2 No. 273	Cablebus	
374	UL 209	Cellular Metal Floor Raceways and Fittings	
	-	UL 360	Liquid-Tight Flexible Metal Conduit
	-	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
376	UL 1953	Power Distribution Blocks	
378	UL 870	Wireways, Auxiliary Gutters, and Associated Fittings	
382	UL 5A	Nonmetallic Surface Raceways and Fittings	
	-	UL183	Manufactured Wiring Systems
	-	UL 467	Grounding and Bonding Equipment
	-	UL 498	Attachment Plugs and Receptacles
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure

Article	Standard Number	Standard Title	
			Types for Environmental Protection
	-	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	-	UL 498M	Marine Shore Power Inlets
	-	UL 514D	Cover Plates for Flush-Mounted Wiring Devices
	-	UL 746C	Polymeric Materials - Use in Electrical Equipment Evaluations
	-	UL 943	Ground-Fault Circuit-Interrupters
	-	UL 991	Tests for Safety-Related Controls Employing Solid-State Devices
	-	UL 1077	Supplementary Protectors for Use in Electrical Equipment
	-	UL 1699	Arc-Fault Circuit-Interrupters
	-	UL 1998	Software in Programmable Components
384	UL 5B	Strut-Type Channel Raceways and Fittings	
386	UL 5	Surface Metal Raceways and Fittings	
388	UL 5A	Nonmetallic Surface Raceways and Fittings	
392	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation	
393	UL 13	Power-Limited Circuit Cables	
	-	UL 50	Enclosures for Electrical Equipment, Non-Environmental Considerations
	-	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	-	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	-	UL 1310	Class 2 and Class 3 Power Supplies
	-	UL 2043	Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces

Article	Standard Number	Standard Title	
	-	UL 2577	Suspended Ceiling Power Grid Systems and Equipment
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
396	UL 1072	Medium-Voltage Power Cables	
400	UL 62	Flexible Cords and Cables	
	-	UL 498	Attachment Plugs and Receptacles
	-	UL 498B	Outline for Receptacles with Integral Switching Means
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles - Enclosure Types for Environmental Protection
	-	UL 817	Cord Sets and Power-Supply Cords
	-	UL Subject 1650	Portable Power Cable
402	UL 66	Fixture Wire	
404	UL 20	General-Use Snap Switches	
	-	UL 98	Enclosed and Dead-Front Switches
	-	UL Subject 98A	Open-Type Switches
	-	UL 363	Knife Switches
	-	UL 489	Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Timers and Time Switches
	-	UL 773	Plug-In Locking Type Photocontrols for Use with Area Lighting
	-	UL 773A	Nonindustrial Photoelectric Switches for Lighting Control
	-	UL 917	Clock-Operated Switches
	-	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	-	UL 1472	Solid-State Dimming Controls
	-	UL 1429	Pullout Switches

Article	Standard Number	Standard Title	
	-	UL 60730-1	Automatic Electrical Controls — Part 1: General Requirements
	-	UL 60730-2	Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Timers and Time Switches
	-	ANSI/NEMA WD 6–2016	Wiring Devices — Dimensional Specifications.
406	UL 498	Attachment Plugs and Receptacles	
	-	UL 498B	Receptacles with Integral Switching Means
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles - Enclosure Types for Environmental Protection
	-	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	-	UL 498M	Marine Shore Power Inlets
	-	UL 514A	Metallic Outlet Boxes
	-	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	-	UL 514D	Cover Plates for Flush-Mounted Wiring Devices
	-	UL 943	Ground-Fault Circuit-Interrupters
	-	UL 943B	Appliance Leakage-Current Interrupters
	-	UL 943C	Outline for Special Purpose Ground-Fault Circuit-Interrupters
	-	UL 970	Merchandising Displays
	-	UL 1286	Office Furnishings
	-	UL 1310	Class 2 and Class 3 Power Units
	-	UL 1682	Plugs, Receptacles, and Cable Connectors, of the Pin and Sleeve Type
	-	UL 1691	Single Pole Locking-Type Separable Connectors
	-	UL 1699	Arc-Fault Circuit-Interrupters
	-	UL 2999	Individual Commercial Office Furnishings

Article	Standard Number	Standard Title	
408	UL 44	Thermoset-Insulated Wires and Cables	
	-	UL 67	Panelboards
	-	UL 891	Switchboards
	-	UL 1558	Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear
	-	UL 60947-1	Low-Voltage Switchgear and Controlgear — Part 1: General Rules
	-	UL 60947-4-1	Low-Voltage Switchgear and Controlgear — Part 4-1: Contactors and Motor-Starters — Electromechanical Contactors and Motor-Starters
	-	UL 60947-4-2	Voltage Switchgear and Controlgear — Part 4-2: Contactors and Motor-Starters — AC Semiconductor Motor Controllers and Starters
	-	UL 60947-5-1	Low-Voltage Switchgear and Controlgear — Part 5-1: Control Circuit Devices and Switching Elements — Electromechanical Control Circuit Devices
	-	UL 60947-5-2	Low-Voltage Switchgear and Controlgear — Part 5-2: Control Circuit Devices and Switching Elements — Proximity Switches
	-	UL 60947-7-1	Low-Voltage Switchgear and Controlgear — Part 7-1: Ancillary Equipment — Terminal Blocks for Copper Conductors
	-	UL 60947-7-2	Low-Voltage Switchgear and Controlgear — Part 7-2: Ancillary Equipment — Protective Conductor Terminal Blocks for Copper Conductors
	-	UL 60947-7-3	Low-Voltage Switchgear and Controlgear — Part 7-3: Ancillary Equipment — Safety Requirements for Fuse Terminal Blocks
409	UL 508	Industrial Control Equipment	
	-	UL 508A	Industrial Control Panels
410	ANSI/CSA-C22.2 No. 184.2	Solid-State Controls for Lighting Systems (SSCLS)	

Article	Standard Number	Standard Title	
-	UL 153	Portable Electric Luminaires
-	UL 496	Lampholders
-	UL 498	Attachment Plugs and Receptacles
-	UL 498B	Outline for Receptacles with Integral Switching Means
-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles - Enclosure Types for Environmental Protection
-	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
-	UL 542	Fluorescent Lamp Starters
-	UL 588	Seasonal and Holiday Decorative Products
-	UL 935	Fluorescent-Lamp Ballasts
-	UL 943	Ground-Fault Circuit-Interrupters
-	UL 970	Merchandising Displays
-	UL 1029	High-Intensity-Discharge Lamp Ballasts
-	UL Subject 1029A	Ignitors and Related Auxiliaries for HID Lamp Ballasts
-	UL 1574	Track Lighting Systems
-	UL 1598	Luminaires
-	UL 1598B	Luminaire Reflector Kits for Installation on Previously Installed Fluorescent Luminaires, Supplemental Requirements
-	UL 1598C	Light-Emitting Diode (LED) Retrofit Luminaire Conversion Kits
-	UL 1993	Self-Ballasted Lamps and Lamp Adapters
-	UL 2388	Flexible Lighting Products
-	UL 8750	Light Emitting Diode (LED) Equipment for Use in Lighting Products
-	UL 8752	Organic Light Emitting Diode (OLED) Panels
-	UL 8753	Field-Replaceable Light Emitting Diode (LED) Light Engines

Article	Standard Number	Standard Title	
	-	UL 8754	Holders, Bases and Connectors for Solid-State (LED) Light Engines and Arrays
	-	UL Subject 8800	Horticultural Lighting Equipment
411	UL 234	Low-Voltage Lighting Fixtures for Use in Recreational Vehicles	
	-	UL 1310	Class 2 and Class 3 Power Units
	-	UL 1838	Low-Voltage Landscape Lighting Systems
	-	UL 2108	Low-Voltage Lighting Systems
	-	UL 5085-3	Class 2 and Class 3 Transformers
422	ANSI/CSA-C22.2 No. 339	Hand-held motor-operated electric tools — Safety — Particular requirements for chain beam saws	
	-	UL 22	Amusement and Gaming Machines
	-	UL 73	Motor-Operated Appliances
	-	UL 82	Electric Gardening Appliances
	-	UL 122	Photographic Equipment
	-	UL 141	Garment Finishing Appliances
	-	UL 174	Household Electric Storage Tank Water Heaters
	-	UL 197	Commercial Electric Cooking Appliances
	-	UL 283	Air Fresheners and Deodorizers
	-	UL 399	Drinking Water Coolers
	-	UL 430	Waste Disposers
	-	UL 474	Dehumidifiers
	-	UL 498	Attachment Plugs and Receptacles
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles - Enclosure Types for Environmental Protection
	-	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts

Article	Standard Number	Standard Title	
-		UL 499	Electric Heating Appliances
-		UL 507	Electric Fans
-		UL 514A	Metallic Outlet Boxes
-		UL 515	Electric Resistance Trace Heating for Commercial Applications
-		UL 561	Floor Finishing Machines
-		UL 574	Electric Oil Heaters
-		UL 621	Ice Cream Makers
-		UL 705	Power Ventilators
-		UL 710B	Recirculating Systems
-		UL 749	Household Dishwashers
-		UL 751	Vending Machines
-		UL 763	Motor-Operated Commercial Food Preparing Machines
-		UL 778	Standard for Motor-Operated Water Pumps
-		UL 834	Heating, Water Supply, and Power Boilers - Electric
-		UL 858	Household Electric Ranges
-		UL 875	Electric Dry-Bath Heaters
-		UL 921	Commercial Dishwashers
-		UL 923	Microwave Cooking Appliances
-		UL 943	Ground-Fault Circuit-Interrupters
-		UL 962	Household and Commercial Furnishings
-		UL 962A	Furniture Power Distribution Units
-		UL 979	Water Treatment Appliances
-		UL 982	Motor-Operated Household Food Preparing Machines
-		UL 987	Stationary and Fixed Electric Tools
-		UL 1017	Vacuum Cleaners, Blower Cleaners, and Household Floor Finishing Machines
-		UL 1026	Household Electric Cooking and Food Serving Appliances
-		UL 1086	Household Trash Compactors
-		UL 1090	Electric Snow Movers
-		UL 1206	Electric Commercial Clothes-Washing Equipment
-		UL 1240	Electric Commercial Clothes-Drying Equipment

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-	UL 1278	Movable and Wall- or Ceiling-Hung Electric Room Heaters
-	UL 1447	Electric Lawn Mowers
-	UL 1450	Motor-Operated Air Compressors, Vacuum Pumps, and Painting Equipment
-	UL 1453	Electric Booster and Commercial Storage Tank Water Heaters
-	UL 1576	Flashlights and Lanterns
-	UL 1594	Sewing and Cutting Machines
-	UL 1647	Motor-Operated Massage and Exercise Machines
-	UL 1727	Commercial Electric Personal Grooming Appliances
-	UL 1776	High-Pressure Cleaning Machines
-	UL 2157	Electric Clothes Washing Machines and Extractors
-	UL 2158	Electric Clothes Dryers
-	UL 2565	Industrial Metalworking and Woodworking Machine Tools
-	60335-2-3	Household and Similar Electrical Appliances, Part 2: Particular Requirements for Electric Irons
-	60335-2-8	Household and Similar Electrical Appliances, Part 2: Particular Requirements for Shavers, Hair Clippers, and Similar Appliances
-	UL 60335-2-24	Household and Similar Electrical Appliances, Part 2: Particular Requirements for Refrigerating Appliances, Ice-Cream Appliances, and Ice-Makers
-	UL 60335-2-40	Household and Similar Electrical Appliances, Part 2: Particular Requirements for Heating and Cooling
-	UL 60335-2-67	Household and Similar Electrical Appliances — Safety — Part 2-67: Particular Requirements for Floor Treatment Machines, For Commercial Use
-	UL 60335-2-68	Household and Similar Electrical Appliances — Safety — Part 2-68:

Article	Standard Number	Standard Title	
			Particular Requirements for Spray Extraction Machines, for Commercial Use
	UL 60335-2-72	Household and Similar Electrical Appliances — Safety — Part 2-68: Particular Requirements for Spray Extraction Machines, for Commercial Use	
	-	UL 60335-2-79	Household and Similar Electrical Appliances — Safety — Part 2-79: Particular Requirements for High Pressure Cleaners and Steam Cleaners
	-	UL 60745-1	Hand-Held Motor-Operated Electric Tools — Safety — Part 1: General Requirements
	-	UL 60745-2-1	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-1: Particular Requirements for Drills and Impact Drills
	-	UL 60745-2-2	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-2: Particular Requirements for Screwdrivers and Impact Wrenches
	-	UL 60745-2-3	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-3: Particular Requirements for Grinders, Polishers, and Disk-Type Sanders
	-	UL 60745-2-4	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-4: Particular Requirements for Sanders and Polishers Other Than Disk Type
	-	UL 60745-2-5	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-5: Particular Requirements for Circular Saws
	-	UL 60745-2-6	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-6: Particular Requirements for Hammers
	-	UL 60745-2-8	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-8: Particular Requirements for Shears and Nibblers

Article	Standard Number	Standard Title
-	UL 60745-2-9	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-9: Particular Requirements for Tappers
-	UL 60745-2-11	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-11: Particular Requirements for Reciprocating Saws
-	UL 60745-2-12	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-12: Particular Requirements For Concrete Vibrators
-	UL 60745-2-13	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-13: Particular Requirements For Chain Saws
-	UL 60745-2-14	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-14: Particular Requirements for Planers
-	UL 60745-2-15	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-15: Particular Requirements for Hedge Trimmers
-	UL 60745-2-16	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-16: Particular Requirements for Tackers
-	UL 60745-2-17	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-17: Particular Requirements for Routers and Trimmers
-	UL 60745-2-18	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-18: Particular Requirements For Strapping Tools
-	UL 60745-2-19	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-19: Particular Requirements for Jointers
-	UL 60745-2-20	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-20: Particular Requirements for Band Saws
-	UL 60745-2-21	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-21: Particular Requirements For Drain Cleaners

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	-	UL 60745-2-22 Hand-Held Motor-Operated electric Tools — Safety — Part 2-22: Particular Requirements for Cut-Off Machines
	-	UL 60745-2-23 Hand-Held Motor-Operated electric Tools — Safety — Part 2-23: Particular Requirements for Die Grinders and Small Rotary Tools
	-	UL 62841-1 Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 1: General Requirements
	-	UL 62841-2-1 Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-1: Particular Requirements For Hand-Held Drills and Impact Drills
	-	UL 62841-2-2 Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-2: Particular Requirements For Screwdrivers And Impact Wrenches
	-	UL 62841-2-3 Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-3: Particular Requirements For Hand-Held Grinders, Polishers, and Disk-Type Sanders
	-	UL 62841-2-4 Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-4: Particular Requirements For Hand-Held Sanders And Polishers Other Than Disc Type
	-	UL 62841-2-5 Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety —

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			Part 2-5: Particular Requirements For Hand-Held Circular Saws
	-	UL 62841-2-8	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-8: Particular Requirements For Hand-Held Shears and Nibblers
	-	UL 62841-2-9	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-9: Particular Requirements For Hand-Held Tappers And Threaders
	-	UL 62841-2-10	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-10: Particular Requirements For Hand-Held Mixers
	-	UL 62841-2-11	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-11: Particular Requirements for Hand-Held Reciprocating Saws
	-	UL 62841-2-14	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-14: Particular Requirements For Hand-Held Planers
	-	UL 62841-2-17	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-17: Particular Requirements For Hand-Held Routers
	-	UL 62841-2-21	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-21: Particular Requirements For Hand-

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		Held Drain Cleaners
-	UL 62841-3-1	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-1: Particular Requirements For Transportable Table Saws
-	UL 62841-3-4	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-4: Particular Requirements for Transportable Bench Grinders
-	UL 62841-3-6	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-6: Particular Requirements For Transportable Diamond Drills with Liquid System
-	UL 62841-3-9	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-9: Particular Requirements For Transportable Mitre Saws
-	UL 62841-3-10	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-10: Particular Requirements for Transportable Cut-Off Machines
-	UL 62841-3-12	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-12: Particular Requirements for Transportable Threading Machines
-	UL 62841-3-13	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-13: Particular

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			Requirements For Transportable Drills
	-	UL 62841-3-14	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-14: Particular Requirements for Transportable Drain Cleaners
	-	UL 62841-3-1000	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-1000: Particular Requirements for Transportable Laser Engravers
	-	UL 62841-4-1	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 4-1: Particular Requirements for Chain Saws
	-	UL 62841-4-2	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 4-2: Particular Requirements for Hedge Trimmers
	-	UL 62841-4-1000	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 4-1000: Particular Requirements For Utility Machines
424	UL 499	Electric Heating Appliances	
	-	UL 1042	Electric Baseboard Heating Equipment
	-	UL 1673	Electric Space Heating Cables
	-	UL 1693	Electric Radiant Heating Panels and Heating Panel Sets
	-	UL 1995	Heating and Cooling Equipment
	-	UL 1996	Electric Duct Heaters

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	-	UL 2021	Fixed and Location-Dedicated Electric Room Heaters
	-	UL 2683	Electric Heating Products for Floor and Ceiling Installation
425	UL 508	Industrial Control Equipment	
	-	UL 2021	Fixed and Location-Dedicated Electric Room Heaters
426	IEEE 515	Electrical Resistance Heat Tracing for Industrial Applications	
	-	UL Subject 1588	Roof and Gutter De-Icing Cable Units
	-	UL Subject 2049	Residential Pipe Heating Cable
427	IEEE 515	Electrical Resistance Heat Tracing for Industrial Applications	
	-	UL 515	Electrical Resistance Heat Tracing for Commercial and Industrial Applications
	-	UL Subject 2049	Residential Pipe Heating Cable
430	UL 4	Armored Cable	
	-	UL 98	Enclosed and Dead-Front Switches
	-	UL 347	Medium-Voltage AC Contactors, Controllers, and Control Centers
	-	UL 347A	Medium Voltage Power Conversion Equipment
	-	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
	-	UL 508	Industrial Control Equipment
	-	UL 705	Power Ventilators
	-	UL 745-1	Portable Electric Tools
	-	UL 845	Motor Control Centers
	-	UL 987	Stationary and Fixed Electric Tools
	-	UL 1004-1	Rotating Electrical Machines — General Requirements
	-	UL 1004-2	Impedance Protected Motors
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-	UL 1004-7	Electronically Protected Motors
-	UL 1004-8	Inverter Duty Motors
-	UL 1004-9	Medium Voltage and Form Wound Motors
-	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
-	UL 1569	Metal Clad Cables
-	UL 1812	Ducted Heat Recovery Ventilators
-	UL 1815	Nonducted Heat Recovery Ventilators
-	UL 2111	Overheating Protection for Motors
-	UL 2565	Industrial Metalworking and Woodworking Machine Tools
-	UL 60034-1	Rotating Electrical Machines
-	UL 60335-2-40	Household and Similar Electrical Appliances — Part 2: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers
-	UL 60730-2-22	Automatic Electrical Controls — Part 2: Particular Requirements for Thermal Motor Protectors
-	UL 60745-1	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery - Safety - Part 1: General Requirements
-	UL 60745-2-1	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-1: Particular Requirements For Hand-Held Drills and Impact Drills
-	UL 60745-2-2	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-2: Particular Requirements For Screwdrivers And Impact Wrenches

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	-	UL 60745-2-3	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-3: Particular Requirements For Hand-Held Grinders, Polishers, and Disk-Type Sanders
	-	UL 60745-2-4	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-4: Particular Requirements For Hand-Held Sanders And Polishers Other Than Disc Type
	-	UL 60745-2-5	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-5: Particular Requirements For Hand-Held Circular Saws
	-	UL 60745-2-8	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-8: Particular Requirements For Hand-Held Shears and Nibblers
	-	UL 60947-1	Low-Voltage Switchgear and Controlgear — Part 1: General Rules
	-	UL 60947-4-1	Low-Voltage Switchgear and Controlgear — Part 4-1: Contactors and Motor-Starters — Electromechanical Contactors and Motor-Starters
	-	UL 60947-4-2	Low-Voltage Switchgear and Controlgear — Part 4-2: Contactors and Motor-Starters — AC Semiconductor Motor Controllers and Starters
	-	UL 60947-5-1	Low-Voltage Switchgear and Controlgear — Part 5-1: Control Circuit Devices and Switching Elements — Electromechanical Control Circuit Devices

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	-	UL 60947-5-2 Low-Voltage Switchgear and Controlgear — Part 5-2: Control Circuit Devices and Switching Elements — Proximity Switches
	-	UL 61800-5-1 Adjustable Speed Electrical Power Drive Systems — Part 5-1: Safety Requirements — Electrical, Thermal and Energy
	-	UL 62841-2-9 Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-9: Particular Requirements For Hand-Held Tappers And Threaders
	-	UL 62841-2-10 Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-10: Particular Requirements For Hand-Held Mixers
	-	UL 62841-2-11 Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-11: Particular Requirements for Hand-Held Reciprocating Saws
	-	UL 62841-2-14 Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-14: Particular Requirements For Hand-Held Planers
	-	UL 62841-2-17 Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-17: Particular Requirements For Hand-Held Routers
	-	UL 62841-2-21 Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-21: Particular Requirements For Hand-Held Drain Cleaners

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	-	UL 62841-3-1 Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-1: Particular Requirements For Transportable Table Saws
	-	UL 62841-3-4 Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-4: Particular Requirements for Transportable Bench Grinders
	-	UL 62841-3-6 Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-6: Particular Requirements For Transportable Diamond Drills with Liquid System
	-	UL 62841-3-9 Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-9: Particular Requirements For Transportable Mitre Saws
	-	UL 62841-3-10 Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-10: Particular requirements for Transportable Cut-Off Machines
	-	UL 62841-3-12 Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-12: Particular requirements for Transportable Threading Machines
	-	UL 62841-3-13 Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-13: Particular Requirements For

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			Transportable Drills
	-	UL 62841-3-14	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-14: Particular requirements for Transportable Drain Cleaners
	-	UL 62841-3-1000	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-1000: Particular Requirements for Transportable Laser Engravers
	-	UL 62841-4-1	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 4-1: Particular Requirements for Chain Saws
	-	UL 62841-4-2	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 4-2: Particular Requirements for Hedge Trimmers
	-	UL 62841-4-1000	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 4-1000: Particular Requirements For Utility Machines
440	UL 416	Refrigerated Medical Equipment	
	-	UL 484	Room Air Conditioners
	-	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
	-	UL 508	Industrial Control Equipment
	-	UL 541	Refrigerated Vending Machines
	-	UL 563	Ice Makers
	-	UL 1995	Heating and Cooling Equipment

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	-	UL 60335-2-24	Household and Similar Electrical Appliances, Part 2: Particular Requirements for Refrigerating Appliances, Ice-Cream Appliances and Ice-Makers
	-	UL 60335-2-40	Household and Similar Electrical Appliances, Part 2: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers
	-	UL 60335-2-89	Household and Similar Electrical Appliances - Safety - Part 2-89: Particular Requirements for Commercial Refrigerating Appliances with an Incorporated or Remote Refrigerant Unit or Compressor
445	UL 508	Industrial Control Equipment	
	-	UL 943C	Outline for Special Purpose Ground-Fault Circuit-Interrupters
	-	UL 973	Ground-Fault Circuit-Interrupters
	-	UL 1004-4	Electric Generators
	-	UL 2200	Stationary Engine Generator Assemblies
450	UL 10C	Positive Pressure Fire Tests of Door Assemblies	
	-	UL 305	Panic Hardware
	-	UL 340	Tests for Comparative Flammability of Liquids
480	UL 10C	Positive Pressure Fire Tests of Door Assemblies	
	-	UL 305	Panic Hardware
	-	UL 1642	Lithium Batteries
	-	UL 1973	Batteries for Use in Stationary, Vehicle Auxiliary Power and Light Electric Rail (LER) Applications
	-	UL 1989	Standby Batteries
	-	UL 2054	Household and Commercial Batteries
	-	UL 4127	Outline for Low Voltage Battery Cable
	-	UL 4128	Intercell and Intertier Connectors for use in Electrochemical Battery System Applications

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490	UL 347	Medium-Voltage AC Contactors, Controllers, and Control Centers	
	-	UL 347A	Medium Voltage Power Conversion Equipment
	-	UL Subject 347B	Medium Voltage Motor Controllers, Up to 15kV
	-	UL Subject 347C	Medium Voltage Solid State Resistive Load Controllers, Up to 15kV
	-	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
	-	UL 1671	Medium Voltage Metal-Clad Switchgear
500	IEEE 844.1	Skin Effect Trace Heating of Pipelines, Vessels, Equipment, and Structures - General, Testing, Marking, and Documentation Requirements	
	-	NFPA 496	Standard for Purged and Pressurized Enclosures for Electrical Equipment
	-	UL 514B	Conduit, Tubing, and Cable Fittings
	-	UL 913	Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous (Classified) Locations
	-	UL 1203	Explosionproof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations
	-	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
	-	UL 60079-28	Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation.
	-	UL 60079-29-1	Explosive Atmospheres — Part 29-1: Gas Detectors — Performance Requirements of Detectors for Flammable Gases
	-	UL 60079-30-1	Explosive Atmospheres — Electrical Resistance Trace Heating — General and Testing Requirements

Article	Standard Number	Standard Title	
	-	UL 121201	Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations
501	ISA 12.12.01	Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations	
	-	NFPA 496	Purged and Pressurized Enclosures for Electrical Equipment
	-	UL 1	Flexible Metal Conduit
	-	UL 13	Power Limited Circuit Cables
	-	UL 248-2	Low-Voltage Fuses — Part 2: Class C Fuses
	-	UL 248-3	Low-Voltage Fuses — Part 3: Class CA and CB Fuses
	-	UL 248-4	Low-Voltage Fuses — Part 4: Class CC Fuses
	-	UL 248-5	Low-Voltage Fuses — Part 5: Class G Fuses
	-	UL 248-6	Low-Voltage Fuses — Part 6: Class H Non-Renewable Fuses
	-	UL 248-8	Low-Voltage Fuses — Part 8: Class J Fuses
	-	UL 248-9	Low-Voltage Fuses — Part 9: Class K Fuses
	-	UL 248-12	Low-Voltage Fuses — Part 12: Class R Fuses
	-	UL 248-15	Low-Voltage Fuses — Part 15: Class T Fuses
	-	UL 467	Grounding and Bonding Equipment
	-	UL 504	Outline for Mineral-Insulated, Metal-Sheathed Cable
	-	UL 674	Electric Motors and Generators for Use in Hazardous (Classified) Locations
	-	UL 783	Electric Flashlights and Lanterns for Use in Hazardous (Classified) Locations
	-	UL 823	Standard for Electric Heaters For Use in Hazardous (Classified) Locations

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	-	UL 844	Luminaires for Use in Hazardous (Classified) Locations
	-	UL 1072	Medium-Voltage Power Cables
	-	UL 1203	Explosionproof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations
	-	UL 1272	Electrical Power and Control Tray Cables with Optional Optical-Fiber Members
	-	UL 1309A	P-Cables
	-	UL 1389	Standard for Plant Oil Extraction Equipment for Installation and Use in Ordinary (Unclassified) Locations and Hazardous (Classified) Locations
	-	UL 1569	Metal-Clad Cables
	-	UL 1836	Outline of Investigation for Electric Motors and Generators for Use in Class I, Division 2, Class I, Zone 2, Class II, Division 2 and Zone 22 Hazardous (Classified) Locations
	-	UL 2011 (Part 3)	Outline of Investigation for Machinery
	-	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
	-	UL 2515A	Supplemental Requirements for Extra Heavy Wall Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
	-	UL 2874	Outline of Investigation for Electric Motors for Use in Hazardous (Classified) Locations - Protection by Pressurized Atmosphere Maintained above the UFL
	-	UL 4300	Outline of Investigation for Electrically Heated Insulated Covers for Compressed Gas Cylinders for Use in Hazardous (Classified) Locations

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	-	UL 60079-28	Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation
	-	UL 60079-30-1	Explosive Atmospheres — Electrical Resistance Trace Heating — General and Testing Requirements
	-	UL 121201	Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations
	-	UL 121303	Guide for Combustible Gas Detection as a Method of Protection
	-	UL 122701	Requirements for Process Sealing Between Electrical Systems and Potentially Flammable or Combustible Process Fluids
502	NFPA 496	Purged and Pressurized Enclosures for Electrical Equipment	
	-	UL 13	Power Limited Circuit Cables
	-	UL 674	Electric Motors and Generators for Use in Hazardous (Classified) Locations
	-	UL 783	Electric Flashlights and Lanterns for Use in Hazardous (Classified) Locations
	-	UL 823	Standard for Electric Heaters For Use in Hazardous (Classified) Locations
	-	UL 844	Luminaires for Use in Hazardous (Classified) Locations
	-	UL 1203	Explosionproof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations
	-	UL 1309	Marine Shipboard Cable

Article	Standard Number	Standard Title	
	-	UL 1836	Outline of Investigation for Electric Motors and Generators for Use in Class I, Division 2, Class I, Zone 2, Class II, Division 2 and Zone 22 Hazardous (Classified) Locations.
	-	UL 2011 (Part 3)	Outline of Investigation for Machinery
	-	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
	-	UL 2250	Instrumentation Tray Cable
	-	UL 60079-28	Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation.
	-	UL 60079-30-1	Explosive Atmospheres — Electrical Resistance Trace Heating — General and Testing Requirements
	-	UL 121201	Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations
503	UL 13	Power Limited Circuit Cables	
	-	UL 823	Standard for Electric Heaters For Use in Hazardous (Classified) Locations
	-	UL 844	Luminaires for Use in Hazardous (Classified) Locations
	-	UL 1203	Explosionproof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations
	-	UL 1836	Outline of Investigation for Electric Motors and Generators for Use in Class I, Division 2, Class I, Zone 2, Class II, Division 2 and Zone 22 Hazardous (Classified) Locations
	-	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
	-	UL 2250	Instrumentation Tray Cable
	-	UL 121201	Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and

Article	Standard Number	Standard Title	
			Class III, Divisions 1 and 2 Hazardous (Classified) Locations
504	UL 698A	Standard for Industrial Control Panels Relating to Hazardous (Classified) Locations	
	-	UL 913	Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous (Classified) Locations
	-	UL 120202	Recommendations for the Preparation, Content, and Organization of Intrinsic Safety Control Drawings
505	IEEE 844.1	Skin Effect Trace Heating of Pipelines, Vessels, Equipment, and Structures — General, Testing, Marking, and Documentation Requirements	
-	-	-	
	-	UL 13	Power Limited Circuit Cables
	-	UL 674	Electric Motors and Generators for Use in Hazardous (Classified) Locations
	-	UL 1203	Explosionproof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations
	-	UL 1309	Marine Shipboard Cable
	-	UL 1389	Standard for Plant Oil Extraction Equipment for Installation and Use in Ordinary (Unclassified) Locations and Hazardous (Classified) Locations
	-	UL 2011 (Part 3)	Outline of Investigation for Machinery
	-	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
	-	UL 2250	Instrumentation Tray Cable
	-	UL 2874	Outline for Electric Motors for Use in Hazardous (Classified) Locations — Protection by Pressurized Atmosphere Maintained above the UFL

Article	Standard Number	Standard Title
-	UL 60079-0	Explosive Gas Atmospheres — Part 0: Equipment — General Requirements
-	UL 60079-1	Explosive Gas Atmospheres — Part 1: Type of Protection — Flameproof “d”
-	UL 60079-2	Standard for Explosive Atmospheres — Part 2: Equipment protection by pressurized enclosure “p”
-	UL 60079-5	Explosive Gas Atmospheres — Part 5: Type of Protection — Powder Filling “q”
-	UL 60079-6	Standard for Explosive Atmospheres — Part 6: Equipment Protection by Liquid Immersion “o”
-	UL 60079-7	Explosive Gas Atmospheres — Part 7: Increased Safety “e”
-	UL 60079-10-1	Part 10-1: Classification of Areas — Explosive Gas Atmospheres
-	UL 60079-11	Explosive Atmospheres — Part 11: Equipment Protection by Intrinsic Safety “i”
-	UL 60079-13	Standard for Explosive Atmospheres — Part 13: Equipment Protection by Pressurized Room “p” and Artificially Ventilated Room “v”
-	UL 60079-15	Electrical Apparatus for Explosive Gas Atmospheres — Part 15: Type of Protection “n”
-	UL 60079-18	Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection — Encapsulation “m”
-	UL 60079-25	Explosive Atmospheres — Part 25: Intrinsically Safe Electrical Systems
-	UL 60079-26	Standard for Explosive Atmospheres — Part 26: Equipment with Equipment Protection Level (EPL) Ga
-	UL 60079-28	Standard for Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems

Article	Standard Number	Standard Title	
			Using Optical Radiation
	-	UL 60079-29-1	Explosive Atmospheres — Part 29-1: Gas Detectors — Performance Requirements of Detectors for Flammable Gases
	-	UL 60079-29-4	Explosive Atmospheres — Part 29-4: Gas Detectors — Performance Requirements of Open Path Detectors for Flammable Gases
	-	UL 60079-30-1	Standard for Explosive Atmospheres — Part 30-1: Electrical Resistance Trace Heating - General and Testing Requirements
	-	UL 122001	General Requirements for Electrical Ignition Systems for Internal Combustion Engines in Class I, Division 2 or Zone 2, Hazardous (Classified) Locations
	-	UL 122701	Requirements for Process Sealing Between Electrical Systems and Flammable or Combustible Process Fluids
506	IEEE 844.1	Skin Effect Trace Heating of Pipelines, Vessels, Equipment, and Structures — General, Testing, Marking, and Documentation Requirements	
-	-	-	
	-	UL 13	Power Limited Circuit Cables
	-	UL 1277	Electrical Power and Control Tray Cables with Optional Optical-Fiber Members
	-	UL 2011 (Part 3)	Outline of Investigation for Machinery
	-	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
	-	UL 60079-0	Explosive Gas Atmospheres — Part 0: Equipment — General Requirements
	-	UL 60079-2	Standard for Explosive atmospheres — Part 2: Equipment protection by pressurized enclosure 'p'

Article	Standard Number	Standard Title	
	-	UL 60079-10-2	Part 10-2: Classification of Areas — Combustible Dust Atmospheres
	-	UL 60079-11	Explosive Atmospheres — Part 11: Equipment Protection by Intrinsic Safety "i"
	-	UL 60079-18	Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection — Encapsulation “m”
	-	UL 60079-28	Standard for Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation
	-	UL 60079-30-1	Explosive Atmospheres — Electrical Resistance Trace Heating — General and Testing Requirements
	-	UL 60079-31	Explosive Atmospheres — Part 31: Equipment Dust Ignition Protection by Enclosure “t”
	-	UL 62784	Vacuum Cleaners and Dust Extractors Providing Equipment Protection Level Dc for the Collection of Combustible Dusts — Particular Requirements
511	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations	
	-	UL 122701	Requirements for Process Sealing Between Electrical Systems and Flammable or Combustible Process Fluids
514	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations	
515	UL 844	Luminaires for Use in Hazardous (Classified) Locations	
516	-	-	
517	AAMI ES60601-1	Medical electrical equipment— Part 1: General requirements for basic safety and essential performance	

Article	Standard Number	Standard Title	
	-	ES-60601-1	AAMI Medical Electrical Equipment — Part 1: General Requirements for Basic Safety and Essential Performance
	-	UL 5	Surface Metal Raceways and Fittings
	-	UL 5A	Nonmetallic Surface Raceways and Fittings
	-	UL 467	Grounding and Bonding Equipment
	-	UL 498	Attachment Plugs and Receptacles
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection
	-	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	-	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	-	UL 1022	Line Isolation Monitors
	-	UL 1047	Isolated Power Systems Equipment
	-	UL 2930	Cord-and-Plug-connected Health Care Facility Outlet Assemblies
	-	UL 60601-1	Medical Electrical Equipment — Part 1: General Requirements for Safety
	-	UL 122701	Requirements for Process Sealing Between Electrical Systems and Flammable or Combustible Process Fluids
518	UL 498	Attachment Plugs and Receptacles	
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection

Article	Standard Number	Standard Title	
	-	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	-	UL 943	Ground-Fault Circuit-Interrupters
	-	UL 943C	Outline for Special Purpose Ground-Fault Circuit-Interrupters
520	UL 62	Flexible Cords and Cables	
	-	UL Subject 334	Theater Lighting Distribution and Control Equipment
	-	UL 1573	Stage and Studio Luminaires and Connector Strips
	-	UL 1640	Portable Power-Distribution Equipment
	-	UL 1691	Single Pole Locking-Type Separable Connectors
522	UL 13	Power Limited Circuit Cables	
	-	UL 1063	Machine-Tool Wires and Cables
	-	UL 2250	Instrumentation Tray Cable
525	UL 62	Flexible Cords and Cables	
	-	UL 817	Cord Sets and Power-Supply Cords
	-	UL 943	Ground-Fault Circuit-Interrupters
	-	UL 943C	Outline for Special Purpose Ground-Fault Circuit-Interrupters
	-	UL 1691	Single Pole Locking-Type Separable Connectors
530	UL 62	Flexible Cords and Cables	
	-	UL 1479	Fire Tests of Penetration Firestops
	-	UL 1573	Stage and Studio Luminaires and Connector Strips
	-	UL 1680	Outline for Stage and Lighting Cables
	-	UL 1691	Single Pole Locking-Type Separable Connectors
	-	UL 1836	Outline of Investigation for Electric Motors and Generators for Use in Class I, Division 2, Class I, Zone 2, Class II, Division 2 and Zone 22 Hazardous (Classified) Locations

Article	Standard Number	Standard Title	
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment - Part 1: Safety Requirements
540	UL 62368-1	Audio/Video, Information and Communication Technology Equipment - Part 1: Safety Requirements	
545	UL 5	Surface Metal Raceways and Fittings	
	-	UL 5A	Nonmetallic Surface Raceways and Fittings
	-	UL 5B	Strut-Type Channel Raceways and Fittings
	-	UL 5C	Surface Raceways and Fittings for Use with Data, Signal, and Control Circuits
	-	UL 20	General Use Snap Switches
	-	UL 209	Cellular Metal Floor Raceways and Fittings
	-	UL 498	Plugs and Receptacles
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection
	-	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	-	UL 514A	Metallic Outlet Boxes
	-	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	-	UL 2024	Cable Routing Assemblies and Communications Raceways
547	UL 50	Enclosures for Electrical Equipment, Non-Environmental Considerations	
	-	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	-	UL 62	Flexible Cords and Cables
	-	UL 514A	Metallic Outlet Boxes

Article	Standard Number	Standard Title	
	-	UL 514B	Conduit, Tubing, and Cable Fittings
	-	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	-	UL 1598	Luminaires
	-	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
550	UL 6	Electrical Rigid Metal Conduit - Steel	
	-	UL 6A	Electrical Rigid Metal Conduit - Aluminum, Red Brass and Stainless Steel
	-	UL 83	Thermoplastic-Insulated Wires and Cables
	-	UL 234	Low Voltage Lighting Fixtures for Use in Recreational Vehicles
	-	UL 307A	Liquid Fuel-Burning Heating Appliances for Manufactured Homes and Recreational Vehicles
	-	UL 307B	Gas-Burning Heating Appliances for Manufactured Homes and Recreational Vehicles
	-	UL 360	Liquid-Tight Flexible Metal Conduit
	-	UL 467	Grounding and Bonding Equipment
	-	UL 498	Plugs and Receptacles
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles - Enclosure Types for Environmental Protection
	-	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	-	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	-	UL 817	Cord Sets and Power-Supply Cords
	-	UL 1242	Electrical Intermediate Metal Conduit — Steel
	-	UL Subject 1462	Mobile Home Pipe Heating Cable
	-	UL 1598	Luminaires

Article	Standard Number	Standard Title	
	-	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	-	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
551	UL 6	Electrical Rigid Metal Conduit — Steel	
	-	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	-	UL 62	Flexible Cords and Cables
	-	UL 231	Power Outlets
	-	UL 360	Liquid-Tight Flexible Metal Conduit
	-	UL 467	Grounding and Bonding Equipment
	-	UL 486C	Splicing Wire Connectors
	-	UL 498	Attachment Plugs and Receptacles
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection
	-	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	-	UL 514A	Metallic Outlet Boxes
	-	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	-	UL 514D	Cover Plates for Flush-Mounted Wiring Devices
	-	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	-	UL 817	Cord Sets and Power-Supply Cords
	-	UL 943	Ground-Fault Circuit-Interrupters
	-	UL 1004-4	Electric Generators
	-	UL 1008	Transfer Switch Equipment
	-	UL 1008M	Outline for Transfer Switch Equipment, Meter Mounted
	-	UL 1008S	Solid-State Transfer Switches
	-	UL 1242	Electrical Intermediate Metal Conduit — Steel

Article	Standard Number	Standard Title	
	-	UL 1449	Surge Protective Devices
	-	UL 1598	Luminaires
	-	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	-	UL 2200	Stationary Engine Generator Assemblies
	-	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
552	SAE J1128-2015	Low Voltage Primary Cable, for Types GXL, HDT, and SXL	
	-	SAE J1127-2015	Low Voltage Battery Cable, for Types SGT and SGR
	-	UL 6	Electrical Rigid Metal Conduit — Steel
	-	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	-	UL 50	Enclosures for Electrical Equipment, Non-Environmental Considerations
	-	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	-	UL 62	Flexible Cords and Cables
	-	UL 67	Panelboards
	-	UL 231	Power Outlets
	-	UL 234	Low Voltage Lighting Fixtures for Use in Recreational Vehicles
	-	UL 360	Liquid-Tight Flexible Metal Conduit
	-	UL 430	Waste Disposers
	-	UL 467	Grounding and Bonding Equipment
	-	UL 514A	Metallic Outlet Boxes
	-	UL 514B	Conduit, Tubing, and Cable Fittings
	-	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	-	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	-	UL 817	Cord Sets and Power-Supply Cords
	-	UL 916	Energy Management Equipment
	-	UL 943	Ground-Fault Circuit-Interrupters

Article	Standard Number	Standard Title	
	-	UL 1004-4	Electric Generators
	-	UL 1242	Electrical Intermediate Metal Conduit — Steel
	-	UL 1563	Electric Spas, Equipment Assemblies, and Associated Equipment
	-	UL 1598	Luminaires
	-	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	-	UL 2200	Stationary Engine Generator Assemblies
	-	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
555	UL 6	Electrical Rigid Metal Conduit — Steel	
	-	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	-	UL 231	Power Outlets
	-	UL 486D	Sealed Wire Connector Systems
	-	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	-	UL 1650	Portable Power Cable
	-	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
590	UL 496	Lampholders	
	-	UL 514B	Conduit, Tubing, and Cable Fittings
	-	UL 588	Seasonal and Holiday Decorative Products
	-	UL 817	Cord Sets
	-	UL 943	Ground-Fault Circuit-Interrupters
	-	UL 1377	Outline for Wire used in Low Voltage Seasonal Lighting Products In Circuits With a Maximum Available Power of 15W
	-	UL 1838	Low Voltage Landscape Lighting Systems
	-	UL 2108	Low Voltage Lighting Systems
600	UL 1	Flexible Metal Conduit	
	-	UL 5	Surface Metal Raceways and Fittings
	-	UL 5A	Nonmetallic Surface Raceways and Fittings

Article	Standard Number	Standard Title	
	-	UL 13	Power-Limited Circuit Cables
	-	UL 48	Electric Signs
	-	UL 50	Enclosures for Electrical Equipment, Non-Environmental Considerations
	-	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	-	UL 98B	Outline for Enclosed and Dead-Front Switches for Use in Photovoltaic Systems
	-	UL 248-19	Low-Voltage Fuses — Part 19: Photovoltaic Fuses
	-	UL 360	Liquid-Tight Flexible Metal Conduit
	-	UL 489B	Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures For Use With Photovoltaic (PV) Systems
	-	UL 508I	Outline for Disconnect Switches Intended for Use in Photovoltaic Systems
	-	UL 814	Gas-Tube-Sign Cable
	-	UL 879	Electric Sign Components
	-	UL 879A	LED Sign and Sign Retrofit Kits
	-	UL Subject 879B	Polymeric Enclosure Systems for the Splice Between Neon Tubing Electrode Leads and GTO Cable, and the GTO Cable Leading to the Splice
	-	UL 943	Ground-Fault Circuit-Interrupters
	-	UL 1310	Class 2 and Class 3 Power Units
	-	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	-	UL 1699B	Photovoltaic (PV) DC Arc-Fault Circuit Protection
	-	UI 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources
	-	UL 2161	Neon Transformers and Power Supplies

Article	Standard Number	Standard Title	
	-	UL 2703	Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels
	-	UL 3001	Distributed Energy Generation and Storage Systems
	-	UL 3003	Outline for Distributed Generation Cables
	-	UL 3703	Solar Trackers
	-	UL 4248-18	Outline for Fuseholders — Part 18: Photovoltaic
	-	UL 4703	Photovoltaic Wire
	-	UL 6703	Connectors for Use in Photovoltaic Systems
	-	UL 7103	Outline for Investigation for Building-Integrated Photovoltaic Roof Coverings
	-	UL 8703	Outline for Concentrator Photovoltaic Modules and Assemblies
	-	UL 8801	Outline for Photovoltaic-Powered Luminaire Systems
	-	UL 9703	Outline for Distributed Generation Wiring Harnesses
	-	UL 61730-1	Photovoltaic (PV) Module Safety Qualification — Part 1: Requirements For Construction
	-	UL 61730-2	Photovoltaic (PV) Module Safety Qualification — Part 2: Requirements For Testing
	-	UL 62109	Power Converters for Use in Photovoltaic Power Systems — Part 1: General Requirements
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
604	UL 1	Flexible Metal Conduit	
	-	UL 4	Armored Cable
	-	UL 5	Surface Metal Raceways and Fittings
	-	UL 5A	Nonmetallic Surface Raceways and Fittings

Article	Standard Number	Standard Title	
	-	UL 5B	Strut-Type Channel Raceways and Fittings
	-	UL 5C	Surface Raceways and Fittings for Use with Data, Signal, and Control Circuits
	-	UL 62	Flexible Cords and Cables
	-	UL 183	Manufactured Wiring Systems
	-	UL 209	Cellular Metal Floor Raceways and Fittings
	-	UL 360	Liquid-Tight Flexible Metal Conduit
	-	UL 857	Busways
	-	UL 1569	Metal-Clad Cables
	-	UL 2024	Cable Routing Assemblies and Communications Raceways
605	UL 962	Household and Commercial Furnishings	
	-	UL 1286	Office Furnishings
	-	UL 1310	Class 2 and Class 3 Power Units
	-	UL 2999	Individual Commercial Office Furnishings
	-	UL 5085	Class 2 and Class 3 Transformers
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment - Part 1: Safety Requirements
610	UL 62	Flexible Cords and Cables	
	-	UL Subject 2273	Festoon Cable
620	UL 62	Flexible Cords and Cables	
	-	UL 83	Thermoplastic-Insulated Wires and Cables
	-	UL 104	Elevator Door Locking Devices and Contacts
	-	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
	-	UL 508	Industrial Control Equipment
	-	UL 508A	Industrial Control Panels
	-	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	-	UL 1310	Class 2 Power Units

Article	Standard Number	Standard Title	
	-	UL 1449	Surge Protective Devices
	-	UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
	-	UL 2556	Wire and Cable Test Methods
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
625	UL 2202	Electric Vehicle (EV) Charging System Equipment	
	-	UL 2231-1	Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits — Part 1: General Requirements
	-	UL 2231-2	Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits — Part 2: Particular Requirements for Protection Devices for Use in Charging Systems
	-	UL 2251	Plugs, Receptacles and Couplers for Electrical Vehicles
	-	UL 2580	Batteries for Use in Electric Vehicles
	-	UL 2594	Electric Vehicle Supply Equipment
	-	UL Subject 9741	Bidirectional Electric Vehicle (EV) Charging System Equipment
626	UL 62	Flexible Cords and Cables	
	-	UL 231	Power Outlets
	-	UL 498	Attachment Plugs and Receptacles
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection
	-	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	-	UL 817	Cord Sets and Power-Supply Cords

Article	Standard Number	Standard Title	
	-	UL 1686	Pin and Sleeve Configurations
630	UL 551	Transformer-Type Arc-Welding Machines	
640	UL 13	Power Limited Circuit Cables	
	-	UL 62	Flexible Cords and Cables
	-	UL 813	Commercial Audio Equipment
	-	UL 1310	Class 2 Power Units
	-	UL 1419	Professional Video and Audio Equipment
	-	UL 1492	Audio-Video Products and Accessories
	-	UL 1711	Amplifiers for Fire Protective Signaling Systems
	-	UL 2269	Outline for Optical Fiber/Communications /Signaling/Coaxial Cable Outlet Boxes
	-	UL 6500	Audio/Video and Musical Instrument Apparatus for Household, Commercial, and Similar General Use
	-	UL 60065	Audio, Video and Similar Electronic Apparatus — Safety Requirements
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
645	UL 38	Manual Signaling Boxes for Fire Alarm Systems	
	-	UL 268	Smoke Detectors for Fire Alarm Systems
	-	UL 444	Communications Cables
	-	UL 464	Audible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories
	-	UL 497B	Protectors for Data Communications and Fire Alarm Circuits
	-	UL 833	Control Units and Accessories for Fire Alarm Systems -
	UL 864	Control Units and Accessories for Fire Alarm Systems	
	-	UL 1425	Cables for Power-Limited Fire-Alarm Circuits

Article	Standard Number	Standard Title	
	-	UL 1426	Cables for Non-Power-Limited Fire-Alarm Circuits
	-	UL 1449	Surge Protective Devices
	-	UL 1480	Speakers for Fire Alarm and Signaling Systems, Including Accessories
	-	UL 1638	Visible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories
	-	UL 1651	Optical Fiber Cable
	-	UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
	-	UL 1690	Data-Processing Cable
	-	UL 1778	Uninterruptible Power Systems
	-	UL 2024	Cable Routing Assemblies and Communications Raceways
	-	UL 60950-1	Information Technology Equipment Safety — Part 1: General Requirements
	-	UL 60950-21	Information Technology Equipment Safety — Part 21: Remote Power Feeding
	-	UL 60950-22	Information Technology Equipment Safety — Part 22: Equipment to be Installed Outdoors
	-	UL 60950-23	Information Technology Equipment Safety — Part 23: Large Data Storage Equipment
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
646	UL 10C	Positive Pressure Fire Tests of Door Assemblies	
	-	UL 62	Flexible Cords and Cables
	-	UL 67	Panelboards
	-	UL 98	Enclosed and Dead-Front Switches
	-	UL 305	Panic Hardware
	-	UL 347	Medium-Voltage AC Contactors, Controllers, and Control Centers
	-	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-

Article	Standard Number	Standard Title	
			Breaker Enclosures
	-	UL 508	Industrial Control Equipment
	-	UL 508A	Industrial Control Panels
	-	UL 845	Motor Control Centers
	-	UL 869A	Reference Standard for Service Equipment
	-	UL 891	Switchboards
	-	UL 891A	Switchboards Rated 601–1000 V
	-	UL 924	Emergency Lighting and Power Equipment
	-	UL 977	Fused Power-Circuit Devices
	-	UL 1008	Transfer Switch Equipment
	-	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
	-	UL 1008M	Meter-Mounted Transfer Switches
	-	UL 1008S	Solid-State Transfer Switches
	-	UL 1062	Unit Substations
	-	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	-	UL 1429	Pullout Switches
	-	UL 1449	Surge Protective Devices
	-	UL 1655	Community-Antenna Television Cables
	-	UL 1989	Standby Batteries
	-	UL Subject 2755	Modular Data Centers
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
647	UL 1598	Luminaires	
650	UL 1310	Class 2 Power Units	
	-	UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
670	ANSI/CSA-C22.2 No. 19085-1	Woodworking machines — Safety — Part 1: Common requirements	
	-	UL 508	Industrial Control Equipment

Article	Standard Number	Standard Title	
	-	UL 61800-5-1	Adjustable Speed Electrical Power Drive Systems — Part 5-1: Safety Requirements — Electrical, Thermal and Energy
	-	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
	-	UL 489G	Outline for Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures, 650–1000 Volts AC and 650–1500 Volts DC
675	UL 493	Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables	
	-	UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords
680	UL 6	Electrical Rigid Metal Conduit — Steel	
	-	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	-	UL 20	General Use Snap-Switches
	-	UL 62	Flexible Cords and Cables
	-	UL 360	Liquid-Tight Flexible Metal Conduit
	-	UL 379	Power Units for Fountain, Swimming Pool, and Spa Luminaires
	-	UL 467	Grounding and Bonding Equipment
	-	UL 486D	Sealed Wire Connector Systems
	-	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	-	UL 676	Underwater Luminaires and Submersible Junction Boxes
	-	UL 676A	Potting Compounds for Swimming Pool, Fountain, and Spa Equipment
	-	UL 943	Ground-Fault Circuit-Interrupters
	-	UL 943C	Outline for Special Purpose Ground-Fault Circuit-Interrupters
	-	UL 1004-10	Pool Pump Motors

Article	Standard Number	Standard Title	
	-	UL 1060	Circuit Breaker and Ground Fault Circuit Interrupters
	-	UL 1081	Swimming Pool Pumps, Filters, and Chlorinators
	-	UL 1241	Isolated Power Systems Equipment
	-	UL 1242	Electrical Intermediate Metal Conduit - Steel
	-	UL 1261	Electric Water Heaters for Pools and Tubs
	-	UL 1563	Electric Spas, Equipment Assemblies, and Associated Equipment
	-	UL 1569	Metal-Clad Cables
	-	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	-	UL 1795	Hydromassage Bathtubs
	-	UL 2420	Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
	-	UL Subject 2452	Outline of Investigation for Electric Swimming Pool and Spa Cover Operators
	-	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
	-	UL 2515A	Supplemental Requirements for Extra Heavy Wall Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
	-	UL 2995	Lifts for Swimming Pools and Spas
	-	UL 60335-2-1000	Household and Similar Electrical Appliances: Particular Requirements for Electrically Powered Pool Lifts
682	UL 486D	Sealed Wire Connector Systems	
	-	UL 1650	Portable Power Cable
690	UL 98B	Enclosed and Dead-Front Switches for Use in Photovoltaic Systems	
	-	UL 248-19	Low-Voltage Fuses — Photovoltaic Fuses
	-	UL 467	Grounding and Bonding Equipment

Article	Standard Number	Standard Title	
	-	UL 489B	Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures for Use with Photovoltaic (PV) Systems
	-	UL Subject 508I	Manual Disconnect Switches Intended for Use in Photovoltaic Systems
	-	UL 1569	Metal-Clad Cables
	-	UL 1699B	Photovoltaic DC Arc-Fault Circuit Protection
	-	UL 1703	Flat-Plate Photovoltaic Modules and Panels
	-	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources
	-	UL 2703	Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels
	-	UL 3001	Distributed Energy Generation and Storage Systems
	-	UL 3003	Distributed Generation Cables
	-	UL 3005	Distributed Energy Resource Management Systems
	-	UL Subject 3703	Solar Trackers
	-	UL Subject 3730	Photovoltaic Junction Boxes
	-	UL 3741	Photovoltaic Hazard Control
	-	UL 4703	Photovoltaic Wire
	-	UL 6703	Connectors for Use in Photovoltaic Systems
	-	UL Subject 6703A	Multi-Pole Connectors for Use in Photovoltaic Systems
	-	UL 7103	Outline for Investigation for Building-Integrated Photovoltaic Roof Coverings
	-	UL Subject 8703	Concentrator Photovoltaic Modules and Assemblies
	-	UL 8801	Outline for Photovoltaic-Powered Luminaire Systems

Article	Standard Number	Standard Title	
	-	UL Subject 9703	Distributed Wiring Harnesses
	-	UL 61730-1	Photovoltaic (PV) Module Safety Qualification — Part 1: Requirements for Construction
	-	UL 61730-2	Photovoltaic (PV) Module Safety Qualification — Part 2: Requirements for Testing
	-	UL 62109-1	Power Converters for Use in Photovoltaic Power Systems — Part 1: General Requirements
	-	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
693	-	-	
692	UL 2262	Outline for Fuel Cell Modules for Use in Portable and Stationary Equipment	
	-	UL 2262A	Outline for Borohydride Fuel Cartridges with Integral Fuel Processing for Use with Portable Fuel Cell Power Systems or Similar Equipment
	-	UL 2265	Fuel Cell Power Units and Fuel Storage Containers for Portable Devices
	-	UL 2265A	Outline for Hand-held or Hand-Transportable Fuel Cell Power Units with Disposable Methanol Fuel Cartridges for use in Original Equipment Manufacturer's Information Technology Equipment
	-	UL 2265C	Outline for Hand-Held or Hand-Transportable Alkaline (Direct Borohydride) Fuel Cell Power Units and Borohydride Fuel Cartridges For Use With Consumer Electronics or Information Technology Equipment
	-	UL 2266	Electromagnetic Compatibility, Electrical Safety, and Physical Protection of Stationary and Portable Fuel Cell Power Systems for Use with Commercial Network Telecommunications Equipment

Article	Standard Number	Standard Title	
	-	UL 2267	Fuel Cell Power Systems for Installation in Industrial Electric Trucks
-	-	-	
694	UL 467	Grounding and Bonding Equipment	
	-	UL Subject 489C	Molded-Case Circuit Breakers and Molded-Case Switches for Use with Wind Turbines
	-	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources
	-	UL 2227	Outline for Flexible Motor Supply Cable and Wind Turbine Tray Cable
	-	UL 2736	Outline for Single Pole Separable Interconnecting Cable Connectors for Use with Wind Turbine Generating Systems
	-	UL 4143	Wind Turbine Generator - Life Time Extension (LTE)
	-	UL 6141	Wind Turbines Permitting Entry of Personnel
	-	UL 6142	Wind Turbine Generating Systems — Small
	-	UL 6171	Wind Turbine Converters and Interconnection Systems Equipment
695	UL 6	Electrical Rigid Metal Conduit — Steel	
	-	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	-	UL 218	Fire Pump Controllers
	-	UL 448	Centrifugal Stationary Pumps for Fire-Protection Service
	-	UL 448B	Residential Fire Pumps Intended for One- and Two-Family Dwellings and Manufactured Homes
	-	UL 448C	Stationary, Rotary-Type, Positive-Displacement Pumps for Fire Protection Service
	-	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	-	UL 1004-5	Fire Pump Motors

Article	Standard Number	Standard Title	
	-	UL 1242	Electrical Intermediate Metal Conduit — Steel
	-	UL 1569	Metal-Clad Cables
	-	UL 1724	Outline for Fire Tests for Electrical Circuit Protective Systems
	-	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
	-	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
696	-	-	
700	UL 924	Emergency Lighting and Power Equipment	
	-	UL 1008	Transfer Switch Equipment
	-	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
	-	UL 1449	Surge Protective Devices
	-	UL 1724	Outline for Fire Tests for Electrical Circuit Protective Systems
	-	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
	-	UL 2200	Stationary Engine Generator Assemblies
701	UL 924	Emergency Lighting and Power Equipment	
	-	UL 1008	Transfer Switch Equipment
	-	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
702	UL 1008	Transfer Switch Equipment	
703	-	-	
	-	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
	-	UL 1008M	Meter-Mounted Transfer Switches
	-	UL 1008S	Solid-State Transfer Switches
705	UL 62	Flexible Cords and Cables	
	-	UL 486D	Sealed Wire Connector Systems
	-	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures

Article	Standard Number	Standard Title	
	-	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	-	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources
	-	UL 2200	Stationary Engine Generator Assemblies
	-	UL 3003	Outline for Distributed Generation Cables
	-	UL 6142	Small Wind Turbine Systems
	-	UL 6171	Wind Turbine Converters and Interconnection Systems Equipment
	-	UL 9540	Energy Storage Systems and Equipment
	-	UL 62109-2	Power Converters for Use in Photovoltaic Power Systems — Part 2: Particular Requirements for Inverters
706	UL 248-2	Low-Voltage Fuses — Part 2: Class C Fuses	
	-	UL 248-3	Low-Voltage Fuses — Part 3: Class CA and CB Fuses
	-	UL 248-4	Low-Voltage Fuses — Part 4: Class CC Fuses
	-	UL 248-5	Low-Voltage Fuses — Part 5: Class G Fuses
	-	UL 248-6	Low-Voltage Fuses — Part 6: Class H Non-Renewable Fuses
	-	UL 248-8	Low-Voltage Fuses — Part 8: Class J Fuses
	-	UL 248-9	Low-Voltage Fuses — Part 9: Class K Fuses
	-	UL 248-12	Low-Voltage Fuses — Part 12: Class R Fuses
	-	UL 248-15	Low-Voltage Fuses — Part 15: Class T Fuses
	-	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
	-	UL 489H	Outline for Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures, for Use with Direct Current (DC) Microgrids

Article	Standard Number	Standard Title	
	-	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	-	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources
	-	UL 9540	Energy Storage Systems and Equipment
708	UL 1	Flexible Metal Conduit	
	-	UL 4	Armored Cable
	-	UL 83	Thermoplastic-Insulated Wires and Cables
	-	UL 360	Liquid-Tight Flexible Metal Conduit
	-	UL 493	Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables
	-	UL 497A	Secondary Protectors for Communications Circuits
	-	UL 1008	Transfer Switch Equipment
	-	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
	-	UL 1008M	Meter-Mounted Transfer Switches
	-	UL 1008S	Solid-State Transfer Switches
	-	UL 1569	Metal-Clad Cables
	-	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
710	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources	
712	UL 248-2	Low-Voltage Fuses — Part 2: Class C Fuses	
	-	UL 248-3	Low-Voltage Fuses — Part 3: Class CA and CB Fuses
	-	UL 248-4	Low-Voltage Fuses — Part 4: Class CC Fuses
	-	UL 248-5	Low-Voltage Fuses — Part 5: Class G Fuses
	-	UL 248-6	Low-Voltage Fuses — Part 6: Class H Non-Renewable Fuses
	-	UL 248-8	Low-Voltage Fuses — Part 8: Class J Fuses

Article	Standard Number	Standard Title	
	-	UL 248-9	Low-Voltage Fuses — Part 9: Class K Fuses
	-	UL 248-12	Low-Voltage Fuses — Part 12: Class R Fuses
	-	UL 248-15	Low-Voltage Fuses — Part 15: Class T Fuses
	-	UL 498G	Outline for Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures, for Use with Direct Current (DC) Microgrids
	-	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	-	UL 1670	Medium Voltage Circuit Breakers and Metal-Clad Switchgear
	-	UL 1671	Medium Voltage Metal-Clad Switchgear
	-	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources
	-	UL 6142	Small Wind Turbine Systems
	-	UL 6171	Wind Turbine Converters and Interconnection Systems Equipment
	-	UL 9540	Energy Storage Systems and Equipment
	-	UL 60947-1	Low-Voltage Switchgear and Controlgear — Part 1: General Rules
	-	UL 60947-4-1	Low-Voltage Switchgear and Controlgear — Part 4-1: Contactors and Motor-Starters — Electromechanical Contactors and Motor-Starters
	-	UL 62109-2	Power Converters for Use in Photovoltaic Power Systems — Part 2: Particular Requirements for Inverters
~~725~~ 722	UL 13		Power-Limited Circuit Cables
	-	UL 444	Communications Cable -
	UL ~~1012~~	~~Power Units Other Than Class 2~~	

Article	Standard Number	Standard Title		
-	~~UL 1277~~	~~Electrical Power and Control Tray Cables with Optional Optical-Fiber Members~~		
-	~~UL 1310~~	~~Class 2 Power Units~~		
-	~~UL~~ 1666	Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts		
	-	UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables	
	-	UL 2196	Fire Test for Circuit Integrity of Fire -Resistive Power, Instrumentation, Control and Data Cables	-
	~~UL~~ UL Subject 9990	Information and Communication Technology (ICT) Power Cables		
	UL 14000-2	Standard for Class 4 Power Cables		
725	UL 1012	Power Units Other Than Class 2		
	UL 1277	Electrical Power and Control Tray Cables with Optional Optical-Fiber Members		
	UL 1310	Class 2 Power Units		
	UL 5085-3	Low Voltage Transformers — Part 3: Class 2 and Class 3 Transformers		
	-	UL ~~Subject 9990~~	~~Information and Communication Technology (ICT) Power Cables~~	~~UL~~ - 62368-1 Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
726	UL 14000-1	Standard for Class 4 Power Systems		
727	UL 2250	Instrumentation Tray Cable		
728	UL 5	Surface Metal Raceways and Fittings		
	-	UL 5A	Nonmetallic Surface Raceways and Fittings	
	-	UL 5B	Strut-Type Channel Raceways and Fittings	
	-	UL 5C	Surface Raceways and Fittings for Use with Data, Signal, and Control Circuits	

Article	Standard Number	Standard Title	
	-	UL 209	Cellular Metal Floor Raceways and Fittings
	-	UL 467	Grounding and Bonding Equipment
	-	UL 514A	Metallic Outlet Boxes
	-	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	-	UL 568	Nonmetallic Cable Tray Systems
	-	UL 884	Underfloor Raceways and Fittings
	-	UL Subject 1724	Fire Tests for Electrical Circuit Protective Systems
	-	UL 2024	Cable Routing Assemblies and Communications Raceways
	-	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
760	UL 268	Smoke Detectors for Fire Alarm Signaling Systems	
	-	UL 268A	Smoke Detectors for Duct Application
	-	UL 486C	Splicing Wire Connectors
	-	UL 497B	Protectors for Data Communication and Fire Alarm Circuits
	-	UL 1424	Cables for Power-Limited Fire-Alarm Circuits
	-	UL 1425	Cables for Non–Power-Limited Fire-Alarm Circuits
	-	UL 1480	Speakers for Fire Alarm and Signaling Systems, Including Accessories
	-	UL 1666	Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts
	-	UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
	-	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
770	UL 467	Grounding and Bonding Equipment	
	-	UL 568	Nonmetallic Cable Tray Systems
	-	UL 1651	Optical Fiber Cable

Article	Standard Number	Standard Title	
	-	UL 2024	Optical Fiber and Communication Cable Raceway
	-	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
	-	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
800	UL 444	Communications Cables	
	-	UL 467	Grounding and Bonding Equipment
	-	UL 489A	Circuit Breakers for Use in Communication Equipment
	-	UL 497	Protectors for Paired-Conductor Communications Circuits
	-	UL 497A	Secondary Protectors for Communications Circuits
	-	UL 497C	Protectors for Coaxial Communications Circuits
	-	UL Subject 497E	Protectors for Antenna Lead-In Conductors
	-	UL Subject 523	Telephone Service Drop Wire
	-	UL 568	Nonmetallic Cable Tray Systems
	-	UL 723	Test for Surface Burning Characteristics of Building Materials
	-	UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords
	-	UL 1666	Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts
	-	UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
	-	UL 1863	Communication Circuit Accessories
	-	UL 2024	Cable Routing Assemblies and Communications Raceways
	-	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
805	UL 444	Communications Cables	

Article	Standard Number	Standard Title	
	-	UL 497	Protectors for Paired-Conductor Communications Circuits
	-	UL 497A	Secondary Protectors for Communications Circuits
	-	UL 497C	Protectors for Coaxial Communications Circuits
	-	UL Subject 497E	Protectors for Antenna Lead-In Conductors
	-	UL Subject 523	Telephone Service Drop Wire
	-	UL 719	Nonmetallic-Sheathed Cables
	-	UL 1310	Class 2 Power Units
	-	UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords
	-	UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
	-	UL 1863	Communication Circuit Accessories
	-	UL 2043	Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces
	-	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
810	UL 150	Antenna Rotators	
	-	UL 452	Antenna-Discharge Units
	-	UL 467	Grounding and Bonding Equipment
	-	UL Subject 497E	Protectors for Antenna Lead-In Conductors
820	UL 444	Communications Cables	
	-	UL Subject 497E	Protectors for Antenna Lead-In Conductors
	-	UL 1655	Community-Antenna Television Cables
830	UL 444	Communications Cables	
	-	UL 497A	Secondary Protectors for Communications Circuits

Article	Standard Number	Standard Title	
	-	UL 497C	Protectors for Coaxial Communications Circuits
	-	UL Subject 497E	Protectors for Antenna Lead-In Conductors
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
840	UL 444	Communications Cables	
	-	UL 467	Grounding and Bonding Equipment
	-	UL 498A	Current Taps and Adapters
	-	UL 1310	Class 2 Power Units
	-	UL 1651	Optical Fiber Cable
	-	UL 1863	Communication Circuit Accessories
	-	UL 2024	Cable Routing Assemblies and Communications Raceways
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
Tables 11(A) and 11(B)	UL 1310	Class 2 Power Units	
	-	UL 1434	Thermistor-Type Devices
	-	UL 5085-3	Class 2 and Class 3 Transformers
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
Tables 12(A) and 12(B)	UL 1310	Class 2 Power Units	
	-	UL 1434	Thermistor-Type Devices
	-	UL 5085-3	Class 2 and Class 3 Transformers
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements

Statement of Problem and Substantiation for Public Comment

With the restructuring and addition of content for Articles 722, 724, 725 and 726, the safety standards

currently listed for Article 725 no longer correlated to their new locations. Additionally, two new standards were added, UL 14000-1 and UL 14000-2 given their relevance to Class 4 circuits that were introduced.

Note that UL 14000-1 and UL 14000-2 have not been formally published at the time of comment submission but are expected to be published prior to NEC 2023 approval.

Related Item

• FR-9606 • FR-9591 • FR-9582

Submitter Information Verification

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Submittal Date: Wed Aug 11 14:26:32 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7541-NFPA 70-2021
Statement: The annex is revised to reference current safety standards. Part 2 has been added to address product safety standards for conductors and equipment that do not have an associated listing requirement

Public Comment No. 1675-NFPA 70-2021 [Section No. A.1]

A.1

Article	Standard Number	Standard Title
110	UL 10C	Positive Pressure Fire Tests of Door Assemblies
	UL 305	Panic Hardware
	UL 486D	Sealed Wire Connector Systems
	UL 2043	Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces
	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
210	UL 935	Fluorescent-Lamp Ballasts
	UL 943	Ground Fault Circuit Interrupters
	UL 1029	High-Intensity-Discharge Lamp Ballast
	UL 1699	Arc-Fault Circuit-Interrupters
225	UL 6	Electrical Rigid Metal Conduit — Steel
	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	UL 360	Liquid-Tight Flexible Metal Conduit
	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	UL 1242	Electrical Intermediate Metal Conduit — Steel
	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
230	UL 6	Electrical Rigid Metal Conduit — Steel
	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	UL 67	Panelboards
	UL 98	Enclosed and Dead-Front Switches
	UL 218	Fire Pump Controllers
	UL 231	Power Outlets
	UL 347	Medium-Voltage AC Contactors, Controllers, and Control Centers
	UL 360	Liquid-Tight Flexible Metal Conduit
	UL 414	Meter Sockets
	UL 486A-486B	Wire Connectors
	UL 486C	Splicing Wire Connectors
	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
	UL 508	Industrial Control Equipment
	UL 508A	Industrial Control Panels
	UL 514B	Conduit, Tubing and Cable Fittings
	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	UL 845	Motor Control Centers
	UL 857	Busways
	UL 869A	Reference Standard for Service Equipment
	UL 891	Switchboards
	UL 891A	Switchboards Rated 601–1000 V
	UL 977	Fused Power-Circuit Devices
	UL 1008	Transfer Switch Equipment
	UL 1008A	Transfer Switch Equipment, Over 1000 Volts

Article	Standard Number	Standard Title
	UL 1008M	Meter-Mounted Transfer Switches
	UL 1008S	Solid-State Transfer Switches
	UL 1053	Ground-Fault Sensing and Relaying Equipment
	UL 1062	Unit Substations
	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	UL 1242	Electrical Intermediate Metal Conduit — Steel
	UL 1429	Pullout Switches
	UL 1449	Surge Protective Devices
	UL 1558	Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear
	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	UL 1740	Robots and Robotic Equipment
	UL 1953	Outline for Power Distribution Blocks
	UL 2011	Outline for Machinery
	UL 2200	Stationary Engine Generator Assemblies
	UL 2416	Audio/Video, Information and Communication Technology Equipment Cabinet, Enclosure and Rack Systems
	UL 2446	Outline for Unitary Boiler Room Systems
	UL 2565	Industrial Metalworking and Woodworking Machine Tools
	UL 2735	Electric Utility Meters
	UL 2745	Outline for Meter Socket Adapters for Communications Equipment
	UL 2876	Outline for Remote Racking Devices for Switchgear and Controlgear
	UL 4248-1	Fuseholders — Part 1: General Requirements
	UL 60947-1	Low-Voltage Switchgear and Controlgear — Part 1: General Rules
	UL 61800-5-1	Adjustable Speed Electrical Power Drive Systems — Part 5-1: Safety Requirements — Electrical, Thermal and Energy
240	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
250	UL 467	Grounding and Bonding Equipment
300	UL 44	Thermoset-Insulated Wires and Cables
	UL 83	Thermoplastic-Insulated Wires and Cables
	UL 83A	Fluoropolymer Insulated Wire
	UL 263	Fire Tests of Building Construction and Materials
	UL 756C	Polymeric Materials — Use in Electrical Equipment Evaluations
	UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords
	UL 2556	Standard for Wire and Cable Test Methods
	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
310	UL 44	Thermoset-Insulated Wires and Cables
	UL 83	Thermoplastic-Insulated Wires and Cables
	UL 83A	Fluoropolymer Insulated Wire
	UL 224	Extruded Insulating Tubing
	UL 1063	Machine-Tool Wires and Cables
	UL 1441	Coated Electrical Sleeving

Article	Standard Number	Standard Title
311	ANSI C119.4	Electric Connectors — Connectors for Use between Aluminum-to-Aluminum and Aluminum-to-Copper Conductors Designed for Normal Operation at or Below 93ºC and Copper-to-Copper Conductors Designed for Normal Operation at or Below 100ºC
	IEEE 48	IEEE Standard for Test Procedures and Requirements for Alternating-Current Cable Terminations Used on Shielded Cables Having Laminated Insulation Rated 2.5kV through 765 kV or Extruded Insulation Rated 2.5 kV through 500 kV
	IEEE 386	IEEE Standard for Separable Insulated Connector Systems for Power Distribution Systems Rated 2.5 kV through 35 kV
	IEEE 404	IEEE Standard for Extruded and Laminated Dielectric Shielded Cable Joints Rated 2.5 kV to 500 kV
	UL 1072	Medium Voltage Power Cables
312	UL 50	Enclosures for Electrical Equipment
	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
314	UL 50	Enclosures for Electrical Equipment
	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	UL 486D	Sealed Wire Connector Systems
	UL 498	Attachment Plugs and Receptacles
	UL 498B	Outline for Receptacles with Integral Switching Means
	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection
	UL 514A	Metallic Outlet Boxes
	UL 514B	Conduit, Tubing, and Cable Fittings
	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	UL 514D	Cover Plates for Flush-Mounted Wiring Devices
	UL 1953	Power Distribution Blocks
320	UL 4	Armored Cable
322	NEMA Publication No. UC2	Under-carpet Power Distribution Systems
324	NEMA Publication No. UC2	Under-carpet Power Distribution Systems
330	UL 1569	Metal-Clad Cables
	UL 2225	Cables and Cable-Fittings For Use In Hazardous (Classified) Locations
332	UL 504	Outline for Mineral-Insulated, Metal-Sheathed Cable
334	UL 719	Nonmetallic-Sheathed Cables
	UL Subject 2256	Nonmetallic Sheathed Cable Interconnects
336	UL 1277	Electrical Power and Control Tray Cables with Optional Optical-Fiber Members
337	UL 1309A	Cable for Use in Mobile Installations
338	UL 854	Service-Entrance Cables
340	UL 493	Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables
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342	UL 1242	Electrical Intermediate Metal Conduit — Steel
344	UL 6	Electrical Rigid Metal Conduit — Steel
	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
348	UL 1	Flexible Metal Conduit
	UL 62275	Cable Management Systems -- Cable Ties for Electrical Installation
350	UL 360	Liquid-Tight Flexible Steel Conduit
	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
352	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
353	UL 651A	Schedule 40 and 80 High Density Polyethylene (HDPE) Conduit
354	UL 1990	Nonmetallic Underground Conduit with Conductors
355	UL 2420	Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
	UL 2515A	Supplemental Requirements for Extra-Heavy Wall Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
356	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
358	UL 797	Electrical Metallic Tubing — Steel
	UL 797A	Electrical Metallic Tubing — Aluminum
360	UL Subject 1652	Flexible Metallic Tubing
362	UL 1653	Electrical Nonmetallic Tubing
	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
366	UL 870	Wireways, Auxiliary Gutters, and Associated Fittings
370	ANSI/CSA C22.2 No. 273	Cablebus
374	UL 209	Cellular Metal Floor Raceways and Fittings
	UL 360	Liquid-Tight Flexible Metal Conduit
	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
376	UL 1953	Power Distribution Blocks
378	UL 870	Wireways, Auxiliary Gutters, and Associated Fittings
382	UL 5A	Nonmetallic Surface Raceways and Fittings
	UL183	Manufactured Wiring Systems
	UL 467	Grounding and Bonding Equipment
	UL 498	Attachment Plugs and Receptacles
	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection
	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	UL 498M	Marine Shore Power Inlets
	UL 514D	Cover Plates for Flush-Mounted Wiring Devices
	UL 746C	Polymeric Materials - Use in Electrical Equipment Evaluations
	UL 943	Ground-Fault Circuit-Interrupters
	UL 991	Tests for Safety-Related Controls Employing Solid-State Devices

Article	Standard Number	Standard Title
	UL 1077	Supplementary Protectors for Use in Electrical Equipment
	UL 1699	Arc-Fault Circuit-Interrupters
	UL 1998	Software in Programmable Components
384	UL 5B	Strut-Type Channel Raceways and Fittings
386	UL 5	Surface Metal Raceways and Fittings
388	UL 5A	Nonmetallic Surface Raceways and Fittings
392	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
393	UL 13	Power-Limited Circuit Cables
	UL 50	Enclosures for Electrical Equipment, Non-Environmental Considerations
	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	UL 1310	Class 2 and Class 3 Power Supplies
	UL 2043	Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces
	UL 2577	Suspended Ceiling Power Grid Systems and Equipment
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
396	UL 1072	Medium-Voltage Power Cables
400	UL 62	Flexible Cords and Cables
	UL 498	Attachment Plugs and Receptacles
	UL 498B	Outline for Receptacles with Integral Switching Means
	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	UL 498E	Attachment Plugs, Cord Connectors and Receptacles - Enclosure Types for Environmental Protection
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404	UL 20	General-Use Snap Switches
	UL 98	Enclosed and Dead-Front Switches
	UL Subject 98A	Open-Type Switches
	UL 363	Knife Switches
	UL 489	Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Timers and Time Switches
	UL 773	Plug-In Locking Type Photocontrols for Use with Area Lighting
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	ANSI/NEMA WD 6–2016	Wiring Devices — Dimensional Specifications.
406	UL 498	Attachment Plugs and Receptacles

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	UL 498B	Receptacles with Integral Switching Means
	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	UL 498E	Attachment Plugs, Cord Connectors and Receptacles - Enclosure Types for Environmental Protection
	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	UL 498M	Marine Shore Power Inlets
	UL 514A	Metallic Outlet Boxes
	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	UL 514D	Cover Plates for Flush-Mounted Wiring Devices
	UL 943	Ground-Fault Circuit-Interrupters
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	UL 943C	Outline for Special Purpose Ground-Fault Circuit-Interrupters
	UL 970	Merchandising Displays
	UL 1286	Office Furnishings
	UL 1310	Class 2 and Class 3 Power Units
	UL 1682	Plugs, Receptacles, and Cable Connectors, of the Pin and Sleeve Type
	UL 1691	Single Pole Locking-Type Separable Connectors
	UL 1699	Arc-Fault Circuit-Interrupters
	UL 2999	Individual Commercial Office Furnishings
408	UL 44	Thermoset-Insulated Wires and Cables
	UL 67	Panelboards
	UL 891	Switchboards
	UL 1558	Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear
	UL 60947-1	Low-Voltage Switchgear and Controlgear — Part 1: General Rules
	UL 60947-4-1	Low-Voltage Switchgear and Controlgear — Part 4-1: Contactors and Motor-Starters — Electromechanical Contactors and Motor-Starters
	UL 60947-4-2	Voltage Switchgear and Controlgear — Part 4-2: Contactors and Motor-Starters — AC Semiconductor Motor Controllers and Starters
	UL 60947-5-1	Low-Voltage Switchgear and Controlgear — Part 5-1: Control Circuit Devices and Switching Elements — Electromechanical Control Circuit Devices
	UL 60947-5-2	Low-Voltage Switchgear and Controlgear — Part 5-2: Control Circuit Devices and Switching Elements — Proximity Switches
	UL 60947-7-1	Low-Voltage Switchgear and Controlgear — Part 7-1: Ancillary Equipment — Terminal Blocks for Copper Conductors
	UL 60947-7-2	Low-Voltage Switchgear and Controlgear — Part 7-2: Ancillary Equipment — Protective Conductor Terminal Blocks for Copper Conductors
	UL 60947-7-3	Low-Voltage Switchgear and Controlgear — Part 7-3: Ancillary Equipment — Safety Requirements for Fuse Terminal Blocks
409	UL 508	Industrial Control Equipment
	UL 508A	Industrial Control Panels
410	ANSI/CSA-C22.2 No. 184.2	Solid-State Controls for Lighting Systems (SSCLS)
	UL 153	Portable Electric Luminaires
	UL 496	Lampholders
	UL 498	Attachment Plugs and Receptacles

Article	Standard Number	Standard Title
	UL 498B	Outline for Receptacles with Integral Switching Means
	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	UL 498E	Attachment Plugs, Cord Connectors and Receptacles - Enclosure Types for Environmental Protection
	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	UL 542	Fluorescent Lamp Starters
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	UL 970	Merchandising Displays
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	UL 1574	Track Lighting Systems
	UL 1598	Luminaires
	UL 1598B	Luminaire Reflector Kits for Installation on Previously Installed Fluorescent Luminaires, Supplemental Requirements
	UL 1598C	Light-Emitting Diode (LED) Retrofit Luminaire Conversion Kits
	UL 1993	Self-Ballasted Lamps and Lamp Adapters
	UL 2388	Flexible Lighting Products
	UL 8750	Light Emitting Diode (LED) Equipment for Use in Lighting Products
	UL 8752	Organic Light Emitting Diode (OLED) Panels
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	UL 8754	Holders, Bases and Connectors for Solid-State (LED) Light Engines and Arrays
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422	ANSI/CSA-C22.2 No. 339	Hand-held motor-operated electric tools — Safety — Particular requirements for chain beam saws
	UL 22	Amusement and Gaming Machines
	UL 73	Motor-Operated Appliances
	UL 82	Electric Gardening Appliances
	UL 122	Photographic Equipment
	UL 141	Garment Finishing Appliances
	UL 174	Household Electric Storage Tank Water Heaters
	UL 197	Commercial Electric Cooking Appliances
	UL 283	Air Fresheners and Deodorizers
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	UL 498	Attachment Plugs and Receptacles

Article	Standard Number	Standard Title
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	UL 498E	Attachment Plugs, Cord Connectors and Receptacles - Enclosure Types for Environmental Protection
	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	UL 499	Electric Heating Appliances
	UL 507	Electric Fans
	UL 514A	Metallic Outlet Boxes
	UL 515	Electric Resistance Trace Heating for Commercial Applications
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	UL 621	Ice Cream Makers
	UL 705	Power Ventilators
	UL 710B	Recirculating Systems
	UL 749	Household Dishwashers
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	UL 763	Motor-Operated Commercial Food Preparing Machines
	UL 778	Standard for Motor-Operated Water Pumps
	UL 834	Heating, Water Supply, and Power Boilers - Electric
	UL 858	Household Electric Ranges
	UL 875	Electric Dry-Bath Heaters
	UL 921	Commercial Dishwashers
	UL 923	Microwave Cooking Appliances
	UL 943	Ground-Fault Circuit-Interrupters
	UL 962	Household and Commercial Furnishings
	UL 962A	Furniture Power Distribution Units
	UL 979	Water Treatment Appliances
	UL 982	Motor-Operated Household Food Preparing Machines
	UL 987	Stationary and Fixed Electric Tools
	UL 1017	Vacuum Cleaners, Blower Cleaners, and Household Floor Finishing Machines
	UL 1026	Household Electric Cooking and Food Serving Appliances
	UL 1086	Household Trash Compactors
	UL 1090	Electric Snow Movers
	UL 1206	Electric Commercial Clothes-Washing Equipment
	UL 1240	Electric Commercial Clothes-Drying Equipment
	UL 1278	Movable and Wall- or Ceiling-Hung Electric Room Heaters
	UL 1447	Electric Lawn Mowers
	UL 1450	Motor-Operated Air Compressors, Vacuum Pumps, and Painting Equipment
	UL 1453	Electric Booster and Commercial Storage Tank Water Heaters
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	UL 1647	Motor-Operated Massage and Exercise Machines
	UL 1727	Commercial Electric Personal Grooming Appliances
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	UL 2158	Electric Clothes Dryers
	UL 2565	Industrial Metalworking and Woodworking Machine Tools
	60335-2-3	Household and Similar Electrical Appliances, Part 2: Particular Requirements for Electric Irons
	60335-2-8	Household and Similar Electrical Appliances, Part 2: Particular Requirements for Shavers, Hair Clippers, and Similar Appliances
	UL 60335-2-24	Household and Similar Electrical Appliances, Part 2: Particular Requirements for Refrigerating Appliances, Ice-Cream Appliances, and Ice-Makers
	UL 60335-2-40	Household and Similar Electrical Appliances, Part 2: Particular Requirements for Heating and Cooling
	UL 60335-2-67	Household and Similar Electrical Appliances — Safety — Part 2-67: Particular Requirements for Floor Treatment Machines, For Commercial Use
	UL 60335-2-68	Household and Similar Electrical Appliances — Safety — Part 2-68: Particular Requirements for Spray Extraction Machines, for Commercial Use
	UL 60335-2-72	Household and Similar Electrical Appliances — Safety — Part 2-68: Particular Requirements for Spray Extraction Machines, for Commercial Use
	UL 60335-2-79	Household and Similar Electrical Appliances — Safety — Part 2-79: Particular Requirements for High Pressure Cleaners and Steam Cleaners
	UL 60745-1	Hand-Held Motor-Operated Electric Tools — Safety — Part 1: General Requirements
	UL 60745-2-1	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-1: Particular Requirements for Drills and Impact Drills
	UL 60745-2-2	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-2: Particular Requirements for Screwdrivers and Impact Wrenches
	UL 60745-2-3	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-3: Particular Requirements for Grinders, Polishers, and Disk-Type Sanders
	UL 60745-2-4	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-4: Particular Requirements for Sanders and Polishers Other Than Disk Type
	UL 60745-2-5	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-5: Particular Requirements for Circular Saws
	UL 60745-2-6	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-6: Particular Requirements for Hammers
	UL 60745-2-8	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-8: Particular Requirements for Shears and Nibblers
	UL 60745-2-9	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-9: Particular Requirements for Tappers
	UL 60745-2-11	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-11: Particular Requirements for Reciprocating Saws
	UL 60745-2-12	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-12: Particular Requirements For Concrete Vibrators
	UL 60745-2-13	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-13: Particular Requirements For Chain Saws
	UL 60745-2-14	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-14: Particular Requirements for Planers

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	UL 60745-2-16	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-16: Particular Requirements for Tackers
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	UL 60745-2-18	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-18: Particular Requirements For Strapping Tools
	UL 60745-2-19	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-19: Particular Requirements for Jointers
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	UL 60745-2-21	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-21: Particular Requirements For Drain Cleaners
	UL 60745-2-22	Hand-Held Motor-Operated electric Tools — Safety — Part 2-22: Particular Requirements for Cut-Off Machines
	UL 60745-2-23	Hand-Held Motor-Operated electric Tools — Safety — Part 2-23: Particular Requirements for Die Grinders and Small Rotary Tools
	UL 62841-1	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 1: General Requirements
	UL 62841-2-1	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-1: Particular Requirements For Hand-Held Drills and Impact Drills
	UL 62841-2-2	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-2: Particular Requirements For Screwdrivers And Impact Wrenches
	UL 62841-2-3	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-3: Particular Requirements For Hand-Held Grinders, Polishers, and Disk-Type Sanders
	UL 62841-2-4	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-4: Particular Requirements For Hand-Held Sanders And Polishers Other Than Disc Type
	UL 62841-2-5	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-5: Particular Requirements For Hand-Held Circular Saws
	UL 62841-2-8	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-8: Particular Requirements For Hand-Held Shears and Nibblers
	UL 62841-2-9	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-9: Particular Requirements For Hand-Held Tappers And Threaders
	UL 62841-2-10	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-10: Particular Requirements For Hand-Held Mixers
	UL 62841-2-11	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-11: Particular Requirements for Hand-Held Reciprocating Saws
	UL 62841-2-14	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-14: Particular Requirements For Hand-Held Planers

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	UL 62841-2-21	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-21: Particular Requirements For Hand-Held Drain Cleaners
	UL 62841-3-1	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-1: Particular Requirements For Transportable Table Saws
	UL 62841-3-4	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-4: Particular Requirements for Transportable Bench Grinders
	UL 62841-3-6	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-6: Particular Requirements For Transportable Diamond Drills with Liquid System
	UL 62841-3-9	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-9: Particular Requirements For Transportable Mitre Saws
	UL 62841-3-10	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-10: Particular Requirements for Transportable Cut-Off Machines
	UL 62841-3-12	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-12: Particular Requirements for Transportable Threading Machines
	UL 62841-3-13	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-13: Particular Requirements For Transportable Drills
	UL 62841-3-14	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-14: Particular Requirements for Transportable Drain Cleaners
	UL 62841-3-1000	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-1000: Particular Requirements for Transportable Laser Engravers
	UL 62841-4-1	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 4-1: Particular Requirements for Chain Saws
	UL 62841-4-2	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 4-2: Particular Requirements for Hedge Trimmers
	UL 62841-4-1000	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 4-1000: Particular Requirements For Utility Machines
424	UL 499	Electric Heating Appliances
	UL 1042	Electric Baseboard Heating Equipment
	UL 1673	Electric Space Heating Cables
	UL 1693	Electric Radiant Heating Panels and Heating Panel Sets
	UL 1995	Heating and Cooling Equipment
	UL 1996	Electric Duct Heaters
	UL 2021	Fixed and Location-Dedicated Electric Room Heaters
	UL 2683	Electric Heating Products for Floor and Ceiling Installation
425	UL 508	Industrial Control Equipment
	UL 2021	Fixed and Location-Dedicated Electric Room Heaters
426	IEEE 515	Electrical Resistance Heat Tracing for Industrial Applications

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	UL Subject 2049	Residential Pipe Heating Cable
427	IEEE 515	Electrical Resistance Heat Tracing for Industrial Applications
	UL 515	Electrical Resistance Heat Tracing for Commercial and Industrial Applications
	UL Subject 2049	Residential Pipe Heating Cable
430	UL 4	Armored Cable
	UL 98	Enclosed and Dead-Front Switches
	UL 347	Medium-Voltage AC Contactors, Controllers, and Control Centers
	UL 347A	Medium Voltage Power Conversion Equipment
	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
	UL 508	Industrial Control Equipment
	UL 705	Power Ventilators
	UL 745-1	Portable Electric Tools
	UL 845	Motor Control Centers
	UL 987	Stationary and Fixed Electric Tools
	UL 1004-1	Rotating Electrical Machines — General Requirements
	UL 1004-2	Impedance Protected Motors
	UL 1004-3	Thermally Protected Motors
	UL 1004-6	Servo and Stepper Motors
	UL 1004-7	Electronically Protected Motors
	UL 1004-8	Inverter Duty Motors
	UL 1004-9	Medium Voltage and Form Wound Motors
	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	UL 1569	Metal Clad Cables
	UL 1812	Ducted Heat Recovery Ventilators
	UL 1815	Nonducted Heat Recovery Ventilators
	UL 2111	Overheating Protection for Motors
	UL 2565	Industrial Metalworking and Woodworking Machine Tools
	UL 60034-1	Rotating Electrical Machines
	UL 60335-2-40	Household and Similar Electrical Appliances — Part 2: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers
	UL 60730-2-22	Automatic Electrical Controls — Part 2: Particular Requirements for Thermal Motor Protectors
	UL 60745-1	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery - Safety - Part 1: General Requirements
	UL 60745-2-1	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-1: Particular Requirements For Hand-Held Drills and Impact Drills
	UL 60745-2-2	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-2: Particular Requirements For Screwdrivers And Impact Wrenches
	UL 60745-2-3	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-3: Particular Requirements For Hand-Held Grinders, Polishers, and Disk-Type Sanders

Article	Standard Number	Standard Title
	UL 60745-2-4	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-4: Particular Requirements For Hand-Held Sanders And Polishers Other Than Disc Type
	UL 60745-2-5	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-5: Particular Requirements For Hand-Held Circular Saws
	UL 60745-2-8	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-8: Particular Requirements For Hand-Held Shears and Nibblers
	UL 60947-1	Low-Voltage Switchgear and Controlgear — Part 1: General Rules
	UL 60947-4-1	Low-Voltage Switchgear and Controlgear — Part 4-1: Contactors and Motor-Starters — Electromechanical Contactors and Motor-Starters
	UL 60947-4-2	Low-Voltage Switchgear and Controlgear — Part 4-2: Contactors and Motor-Starters — AC Semiconductor Motor Controllers and Starters
	UL 60947-5-1	Low-Voltage Switchgear and Controlgear — Part 5-1: Control Circuit Devices and Switching Elements — Electromechanical Control Circuit Devices
	UL 60947-5-2	Low-Voltage Switchgear and Controlgear — Part 5-2: Control Circuit Devices and Switching Elements — Proximity Switches
	UL 61800-5-1	Adjustable Speed Electrical Power Drive Systems — Part 5-1: Safety Requirements — Electrical, Thermal and Energy
	UL 62841-2-9	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-9: Particular Requirements For Hand-Held Tappers And Threaders
	UL 62841-2-10	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-10: Particular Requirements For Hand-Held Mixers
	UL 62841-2-11	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-11: Particular Requirements for Hand-Held Reciprocating Saws
	UL 62841-2-14	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-14: Particular Requirements For Hand-Held Planers
	UL 62841-2-17	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-17: Particular Requirements For Hand-Held Routers
	UL 62841-2-21	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-21: Particular Requirements For Hand-Held Drain Cleaners
	UL 62841-3-1	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-1: Particular Requirements For Transportable Table Saws
	UL 62841-3-4	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-4: Particular Requirements for Transportable Bench Grinders
	UL 62841-3-6	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-6: Particular Requirements For Transportable Diamond Drills with Liquid System
	UL 62841-3-9	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-9: Particular Requirements For Transportable Mitre Saws

Article	Standard Number	Standard Title
	UL 62841-3-10	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-10: Particular requirements for Transportable Cut-Off Machines
	UL 62841-3-12	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-12: Particular requirements for Transportable Threading Machines
	UL 62841-3-13	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-13: Particular Requirements For Transportable Drills
	UL 62841-3-14	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-14: Particular requirements for Transportable Drain Cleaners
	UL 62841-3-1000	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-1000: Particular Requirements for Transportable Laser Engravers
	UL 62841-4-1	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 4-1: Particular Requirements for Chain Saws
	UL 62841-4-2	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 4-2: Particular Requirements for Hedge Trimmers
	UL 62841-4-1000	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 4-1000: Particular Requirements For Utility Machines
440	UL 416	Refrigerated Medical Equipment
	UL 484	Room Air Conditioners
	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
	UL 508	Industrial Control Equipment
	UL 541	Refrigerated Vending Machines
	UL 563	Ice Makers
	UL 1995	Heating and Cooling Equipment
	UL 60335-2-24	Household and Similar Electrical Appliances, Part 2: Particular Requirements for Refrigerating Appliances, Ice-Cream Appliances and Ice-Makers
	UL 60335-2-40	Household and Similar Electrical Appliances, Part 2: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers
	UL 60335-2-89	Household and Similar Electrical Appliances - Safety - Part 2-89: Particular Requirements for Commercial Refrigerating Appliances with an Incorporated or Remote Refrigerant Unit or Compressor
445	UL 508	Industrial Control Equipment
	UL 943C	Outline for Special Purpose Ground-Fault Circuit-Interrupters
	UL 973	Ground-Fault Circuit-Interrupters
	UL 1004-4	Electric Generators
	UL 2200	Stationary Engine Generator Assemblies
450	UL 10C	Positive Pressure Fire Tests of Door Assemblies
	UL 305	Panic Hardware
	UL 340	Tests for Comparative Flammability of Liquids
480	UL 10C	Positive Pressure Fire Tests of Door Assemblies
	UL 305	Panic Hardware

Article	Standard Number	Standard Title
	UL 1642	Lithium Batteries
	UL 1973	Batteries for Use in Stationary, Vehicle Auxiliary Power and Light Electric Rail (LER) Applications
	UL 1989	Standby Batteries
	UL 2054	Household and Commercial Batteries
	UL 4127	Outline for Low Voltage Battery Cable
	UL 4128	Intercell and Intertier Connectors for use in Electrochemical Battery System Applications
490	UL 347	Medium-Voltage AC Contactors, Controllers, and Control Centers
	UL 347A	Medium Voltage Power Conversion Equipment
	UL Subject 347B	Medium Voltage Motor Controllers, Up to 15kV
	UL Subject 347C	Medium Voltage Solid State Resistive Load Controllers, Up to 15kV
	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
	UL 1671	Medium Voltage Metal-Clad Switchgear
500	IEEE 844.1	Skin Effect Trace Heating of Pipelines, Vessels, Equipment, and Structures - General, Testing, Marking, and Documentation Requirements
	NFPA 496	Standard for Purged and Pressurized Enclosures for Electrical Equipment
	UL 514B	Conduit, Tubing, and Cable Fittings
	UL 913	Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous (Classified) Locations
	UL 1203	Explosionproof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations
	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
	UL 60079-28	Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation.
	UL 60079-29-1	Explosive Atmospheres — Part 29-1: Gas Detectors — Performance Requirements of Detectors for Flammable Gases
	UL 60079-30-1	Explosive Atmospheres — Electrical Resistance Trace Heating — General and Testing Requirements
	UL 121201	Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations
501	ISA 12.12.01	Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations
	NFPA 496	Purged and Pressurized Enclosures for Electrical Equipment
	UL 1	Flexible Metal Conduit
	UL 13	Power Limited Circuit Cables
	UL 248-2	Low-Voltage Fuses — Part 2: Class C Fuses
	UL 248-3	Low-Voltage Fuses — Part 3: Class CA and CB Fuses
	UL 248-4	Low-Voltage Fuses — Part 4: Class CC Fuses
	UL 248-5	Low-Voltage Fuses — Part 5: Class G Fuses
	UL 248-6	Low-Voltage Fuses — Part 6: Class H Non-Renewable Fuses
	UL 248-8	Low-Voltage Fuses — Part 8: Class J Fuses
	UL 248-9	Low-Voltage Fuses — Part 9: Class K Fuses
	UL 248-12	Low-Voltage Fuses — Part 12: Class R Fuses
	UL 248-15	Low-Voltage Fuses — Part 15: Class T Fuses
	UL 467	Grounding and Bonding Equipment

Article	Standard Number	Standard Title
	UL 504	Outline for Mineral-Insulated, Metal-Sheathed Cable
	UL 674	Electric Motors and Generators for Use in Hazardous (Classified) Locations
	UL 783	Electric Flashlights and Lanterns for Use in Hazardous (Classified) Locations
	UL 823	Standard for Electric Heaters For Use in Hazardous (Classified) Locations
	UL 844	Luminaires for Use in Hazardous (Classified) Locations
	UL 1072	Medium-Voltage Power Cables
	UL 1203	Explosionproof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations
	UL 1272	Electrical Power and Control Tray Cables with Optional Optical-Fiber Members
	UL 1309A	P-Cables
	UL 1389	Standard for Plant Oil Extraction Equipment for Installation and Use in Ordinary (Unclassified) Locations and Hazardous (Classified) Locations
	UL 1569	Metal-Clad Cables
	UL 1836	Outline of Investigation for Electric Motors and Generators for Use in Class I, Division 2, Class I, Zone 2, Class II, Division 2 and Zone 22 Hazardous (Classified) Locations
	UL 2011 (Part 3)	Outline of Investigation for Machinery
	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
	UL 2515A	Supplemental Requirements for Extra Heavy Wall Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
	UL 2874	Outline of Investigation for Electric Motors for Use in Hazardous (Classified) Locations - Protection by Pressurized Atmosphere Maintained above the UFL
	UL 4300	Outline of Investigation for Electrically Heated Insulated Covers for Compressed Gas Cylinders for Use in Hazardous (Classified) Locations
	UL 60079-28	Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation
	UL 60079-30-1	Explosive Atmospheres — Electrical Resistance Trace Heating — General and Testing Requirements
	UL 121201	Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations
	UL 121303	Guide for Combustible Gas Detection as a Method of Protection
	UL 122701	Requirements for Process Sealing Between Electrical Systems and Potentially Flammable or Combustible Process Fluids
502	NFPA 496	Purged and Pressurized Enclosures for Electrical Equipment
	UL 13	Power Limited Circuit Cables
	UL 674	Electric Motors and Generators for Use in Hazardous (Classified) Locations
	UL 783	Electric Flashlights and Lanterns for Use in Hazardous (Classified) Locations
	UL 823	Standard for Electric Heaters For Use in Hazardous (Classified) Locations
	UL 844	Luminaires for Use in Hazardous (Classified) Locations
	UL 1203	Explosionproof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations

Article	Standard Number	Standard Title
	UL 1309	Marine Shipboard Cable
	UL 1836	Outline of Investigation for Electric Motors and Generators for Use in Class I, Division 2, Class I, Zone 2, Class II, Division 2 and Zone 22 Hazardous (Classified) Locations.
	UL 2011 (Part 3)	Outline of Investigation for Machinery
	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
	UL 2250	Instrumentation Tray Cable
	UL 60079-28	Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation.
	UL 60079-30-1	Explosive Atmospheres — Electrical Resistance Trace Heating — General and Testing Requirements
	UL 121201	Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations
503	UL 13	Power Limited Circuit Cables
	UL 823	Standard for Electric Heaters For Use in Hazardous (Classified) Locations
	UL 844	Luminaires for Use in Hazardous (Classified) Locations
	UL 1203	Explosionproof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations
	UL 1836	Outline of Investigation for Electric Motors and Generators for Use in Class I, Division 2, Class I, Zone 2, Class II, Division 2 and Zone 22 Hazardous (Classified) Locations
	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
	UL 2250	Instrumentation Tray Cable
	UL 121201	Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations
504	UL 698A	Standard for Industrial Control Panels Relating to Hazardous (Classified) Locations
	UL 913	Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous (Classified) Locations
	UL 120202	Recommendations for the Preparation, Content, and Organization of Intrinsic Safety Control Drawings
505	IEEE 844.1	Skin Effect Trace Heating of Pipelines, Vessels, Equipment, and Structures — General, Testing, Marking, and Documentation Requirements
	UL 13	Power Limited Circuit Cables
	UL 674	Electric Motors and Generators for Use in Hazardous (Classified) Locations
	UL 1203	Explosionproof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations
	UL 1309	Marine Shipboard Cable
	UL 1389	Standard for Plant Oil Extraction Equipment for Installation and Use in Ordinary (Unclassified) Locations and Hazardous (Classified) Locations
	UL 2011 (Part 3)	Outline of Investigation for Machinery
	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
	UL 2250	Instrumentation Tray Cable
	UL 2874	Outline for Electric Motors for Use in Hazardous (Classified) Locations — Protection by Pressurized Atmosphere Maintained above the UFL

Article	Standard Number	Standard Title
	UL 60079-0	Explosive Gas Atmospheres — Part 0: Equipment — General Requirements
	UL 60079-1	Explosive Gas Atmospheres — Part 1: Type of Protection — Flameproof “d”
	UL 60079-2	Standard for Explosive Atmospheres — Part 2: Equipment protection by pressurized enclosure “p”
	UL 60079-5	Explosive Gas Atmospheres — Part 5: Type of Protection — Powder Filling “q”
	UL 60079-6	Standard for Explosive Atmospheres — Part 6: Equipment Protection by Liquid Immersion “o”
	UL 60079-7	Explosive Gas Atmospheres — Part 7: Increased Safety “e”
	UL 60079-10-1	Part 10-1: Classification of Areas — Explosive Gas Atmospheres
	UL 60079-11	Explosive Atmospheres — Part 11: Equipment Protection by Intrinsic Safety “i”
	UL 60079-13	Standard for Explosive Atmospheres — Part 13: Equipment Protection by Pressurized Room “p” and Artificially Ventilated Room “v”
	UL 60079-15	Electrical Apparatus for Explosive Gas Atmospheres — Part 15: Type of Protection “n”
	UL 60079-18	Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection — Encapsulation “m”
	UL 60079-25	Explosive Atmospheres — Part 25: Intrinsically Safe Electrical Systems
	UL 60079-26	Standard for Explosive Atmospheres — Part 26: Equipment with Equipment Protection Level (EPL) Ga
	UL 60079-28	Standard for Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation
	UL 60079-29-1	Explosive Atmospheres — Part 29-1: Gas Detectors — Performance Requirements of Detectors for Flammable Gases
	UL 60079-29-4	Explosive Atmospheres — Part 29-4: Gas Detectors — Performance Requirements of Open Path Detectors for Flammable Gases
	UL 60079-30-1	Standard for Explosive Atmospheres — Part 30-1: Electrical Resistance Trace Heating - General and Testing Requirements
	UL 122001	General Requirements for Electrical Ignition Systems for Internal Combustion Engines in Class I, Division 2 or Zone 2, Hazardous (Classified) Locations
	UL 122701	Requirements for Process Sealing Between Electrical Systems and Flammable or Combustible Process Fluids
506	IEEE 844.1	Skin Effect Trace Heating of Pipelines, Vessels, Equipment, and Structures — General, Testing, Marking, and Documentation Requirements
	UL 13	Power Limited Circuit Cables
	UL 1277	Electrical Power and Control Tray Cables with Optional Optical-Fiber Members
	UL 2011 (Part 3)	Outline of Investigation for Machinery
	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
	UL 60079-0	Explosive Gas Atmospheres — Part 0: Equipment — General Requirements
	UL 60079-2	Standard for Explosive atmospheres — Part 2: Equipment protection by pressurized enclosure 'p'
	UL 60079-10-2	Part 10-2: Classification of Areas — Combustible Dust Atmospheres

Article	Standard Number	Standard Title
	UL 60079-11	Explosive Atmospheres — Part 11: Equipment Protection by Intrinsic Safety "i"
	UL 60079-18	Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection — Encapsulation “m”
	UL 60079-28	Standard for Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation
	UL 60079-30-1	Explosive Atmospheres — Electrical Resistance Trace Heating — General and Testing Requirements
	UL 60079-31	Explosive Atmospheres — Part 31: Equipment Dust Ignition Protection by Enclosure “t”
	UL 62784	Vacuum Cleaners and Dust Extractors Providing Equipment Protection Level Dc for the Collection of Combustible Dusts — Particular Requirements
511	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
	UL 122701	Requirements for Process Sealing Between Electrical Systems and Flammable or Combustible Process Fluids
514	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
515	UL 844	Luminaires for Use in Hazardous (Classified) Locations
516		
517	AAMI ES60601-1	Medical electrical equipment— Part 1: General requirements for basic safety and essential performance
	ES-60601-1	AAMI Medical Electrical Equipment — Part 1: General Requirements for Basic Safety and Essential Performance
	UL 5	Surface Metal Raceways and Fittings
	UL 5A	Nonmetallic Surface Raceways and Fittings
	UL 467	Grounding and Bonding Equipment
	UL 498	Attachment Plugs and Receptacles
	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection
	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	UL 1022	Line Isolation Monitors
	UL 1047	Isolated Power Systems Equipment
	UL 2930	Cord-and-Plug-connected Health Care Facility Outlet Assemblies
	UL 60601-1	Medical Electrical Equipment — Part 1: General Requirements for Safety
	UL 122701	Requirements for Process Sealing Between Electrical Systems and Flammable or Combustible Process Fluids
518	UL 498	Attachment Plugs and Receptacles
	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection
	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	UL 943	Ground-Fault Circuit-Interrupters
	UL 943C	Outline for Special Purpose Ground-Fault Circuit-Interrupters

Article	Standard Number	Standard Title
520	UL 62	Flexible Cords and Cables
	UL Subject 334	Theater Lighting Distribution and Control Equipment
	UL 1573	Stage and Studio Luminaires and Connector Strips
	UL 1640	Portable Power-Distribution Equipment
	UL 1691	Single Pole Locking-Type Separable Connectors
522	UL 13	Power Limited Circuit Cables
	UL 1063	Machine-Tool Wires and Cables
	UL 2250	Instrumentation Tray Cable
525	UL 62	Flexible Cords and Cables
	UL 817	Cord Sets and Power-Supply Cords
	UL 943	Ground-Fault Circuit-Interrupters
	UL 943C	Outline for Special Purpose Ground-Fault Circuit-Interrupters
	UL 1691	Single Pole Locking-Type Separable Connectors
530	UL 62	Flexible Cords and Cables
	UL 1479	Fire Tests of Penetration Firestops
	UL 1573	Stage and Studio Luminaires and Connector Strips
	UL 1680	Outline for Stage and Lighting Cables
	UL 1691	Single Pole Locking-Type Separable Connectors
	UL 1836	Outline of Investigation for Electric Motors and Generators for Use in Class I, Division 2, Class I, Zone 2, Class II, Division 2 and Zone 22 Hazardous (Classified) Locations
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment - Part 1: Safety Requirements
540	UL 62368-1	Audio/Video, Information and Communication Technology Equipment - Part 1: Safety Requirements
545	UL 5	Surface Metal Raceways and Fittings
	UL 5A	Nonmetallic Surface Raceways and Fittings
	UL 5B	Strut-Type Channel Raceways and Fittings
	UL 5C	Surface Raceways and Fittings for Use with Data, Signal, and Control Circuits
	UL 20	General Use Snap Switches
	UL 209	Cellular Metal Floor Raceways and Fittings
	UL 498	Plugs and Receptacles
	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection
	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	UL 514A	Metallic Outlet Boxes
	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	UL 2024	Cable Routing Assemblies and Communications Raceways
547	UL 50	Enclosures for Electrical Equipment, Non-Environmental Considerations
	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	UL 62	Flexible Cords and Cables
	UL 514A	Metallic Outlet Boxes
	UL 514B	Conduit, Tubing, and Cable Fittings

Article	Standard Number	Standard Title
	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	UL 1598	Luminaires
	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
550	UL 6	Electrical Rigid Metal Conduit - Steel
	UL 6A	Electrical Rigid Metal Conduit - Aluminum, Red Brass and Stainless Steel
	UL 83	Thermoplastic-Insulated Wires and Cables
	UL 234	Low Voltage Lighting Fixtures for Use in Recreational Vehicles
	UL 307A	Liquid Fuel-Burning Heating Appliances for Manufactured Homes and Recreational Vehicles
	UL 307B	Gas-Burning Heating Appliances for Manufactured Homes and Recreational Vehicles
	UL 360	Liquid-Tight Flexible Metal Conduit
	UL 467	Grounding and Bonding Equipment
	UL 498	Plugs and Receptacles
	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	UL 498E	Attachment Plugs, Cord Connectors and Receptacles - Enclosure Types for Environmental Protection
	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	UL 817	Cord Sets and Power-Supply Cords
	UL 1242	Electrical Intermediate Metal Conduit — Steel
	UL Subject 1462	Mobile Home Pipe Heating Cable
	UL 1598	Luminaires
	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
551	UL 6	Electrical Rigid Metal Conduit — Steel
	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	UL 62	Flexible Cords and Cables
	UL 231	Power Outlets
	UL 360	Liquid-Tight Flexible Metal Conduit
	UL 467	Grounding and Bonding Equipment
	UL 486C	Splicing Wire Connectors
	UL 498	Attachment Plugs and Receptacles
	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection
	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	UL 514A	Metallic Outlet Boxes
	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	UL 514D	Cover Plates for Flush-Mounted Wiring Devices
	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings

Article	Standard Number	Standard Title
	UL 817	Cord Sets and Power-Supply Cords
	UL 943	Ground-Fault Circuit-Interrupters
	UL 1004-4	Electric Generators
	UL 1008	Transfer Switch Equipment
	UL 1008M	Outline for Transfer Switch Equipment, Meter Mounted
	UL 1008S	Solid-State Transfer Switches
	UL 1242	Electrical Intermediate Metal Conduit — Steel
	UL 1449	Surge Protective Devices
	UL 1598	Luminaires
	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	UL 2200	Stationary Engine Generator Assemblies
	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
552	SAE J1128-2015	Low Voltage Primary Cable, for Types GXL, HDT, and SXL
	SAE J1127-2015	Low Voltage Battery Cable, for Types SGT and SGR
	UL 6	Electrical Rigid Metal Conduit — Steel
	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	UL 50	Enclosures for Electrical Equipment, Non-Environmental Considerations
	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	UL 62	Flexible Cords and Cables
	UL 67	Panelboards
	UL 231	Power Outlets
	UL 234	Low Voltage Lighting Fixtures for Use in Recreational Vehicles
	UL 360	Liquid-Tight Flexible Metal Conduit
	UL 430	Waste Disposers
	UL 467	Grounding and Bonding Equipment
	UL 514A	Metallic Outlet Boxes
	UL 514B	Conduit, Tubing, and Cable Fittings
	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	UL 817	Cord Sets and Power-Supply Cords
	UL 916	Energy Management Equipment
	UL 943	Ground-Fault Circuit-Interrupters
	UL 1004-4	Electric Generators
	UL 1242	Electrical Intermediate Metal Conduit — Steel
	UL 1563	Electric Spas, Equipment Assemblies, and Associated Equipment
	UL 1598	Luminaires
	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	UL 2200	Stationary Engine Generator Assemblies
	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
555	UL 6	Electrical Rigid Metal Conduit — Steel
	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	UL 231	Power Outlets

Article	Standard Number	Standard Title
	UL 486D	Sealed Wire Connector Systems
	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	UL 1650	Portable Power Cable
	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
590	UL 496	Lampholders
	UL 514B	Conduit, Tubing, and Cable Fittings
	UL 588	Seasonal and Holiday Decorative Products
	UL 817	Cord Sets
	UL 943	Ground-Fault Circuit-Interrupters
	UL 1377	Outline for Wire used in Low Voltage Seasonal Lighting Products In Circuits With a Maximum Available Power of 15W
	UL 1838	Low Voltage Landscape Lighting Systems
	UL 2108	Low Voltage Lighting Systems
600	UL 1	Flexible Metal Conduit
	UL 5	Surface Metal Raceways and Fittings
	UL 5A	Nonmetallic Surface Raceways and Fittings
	UL 13	Power-Limited Circuit Cables
	UL 48	Electric Signs
	UL 50	Enclosures for Electrical Equipment, Non-Environmental Considerations
	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	UL 98B	Outline for Enclosed and Dead-Front Switches for Use in Photovoltaic Systems
	UL 248-19	Low-Voltage Fuses — Part 19: Photovoltaic Fuses
	UL 360	Liquid-Tight Flexible Metal Conduit
	UL 489B	Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures For Use With Photovoltaic (PV) Systems
	UL 508I	Outline for Disconnect Switches Intended for Use in Photovoltaic Systems
	UL 814	Gas-Tube-Sign Cable
	UL 879	Electric Sign Components
	UL 879A	LED Sign and Sign Retrofit Kits
	UL Subject 879B	Polymeric Enclosure Systems for the Splice Between Neon Tubing Electrode Leads and GTO Cable, and the GTO Cable Leading to the Splice
	UL 943	Ground-Fault Circuit-Interrupters
	UL 1310	Class 2 and Class 3 Power Units
	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	UL 1699B	Photovoltaic (PV) DC Arc-Fault Circuit Protection
	Ul 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources
	UL 2161	Neon Transformers and Power Supplies
	UL 2703	Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels
	UL 3001	Distributed Energy Generation and Storage Systems
	UL 3003	Outline for Distributed Generation Cables

Article	Standard Number	Standard Title
	UL 3703	Solar Trackers
	UL 4248-18	Outline for Fuseholders — Part 18: Photovoltaic
	UL 4703	Photovoltaic Wire
	UL 6703	Connectors for Use in Photovoltaic Systems
	UL 7103	Outline for Investigation for Building-Integrated Photovoltaic Roof Coverings
	UL 8703	Outline for Concentrator Photovoltaic Modules and Assemblies
	UL 8801	Outline for Photovoltaic-Powered Luminaire Systems
	UL 9703	Outline for Distributed Generation Wiring Harnesses
	UL 61730-1	Photovoltaic (PV) Module Safety Qualification — Part 1: Requirements For Construction
	UL 61730-2	Photovoltaic (PV) Module Safety Qualification — Part 2: Requirements For Testing
	UL 62109	Power Converters for Use in Photovoltaic Power Systems — Part 1: General Requirements
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
604	UL 1	Flexible Metal Conduit
	UL 4	Armored Cable
	UL 5	Surface Metal Raceways and Fittings
	UL 5A	Nonmetallic Surface Raceways and Fittings
	UL 5B	Strut-Type Channel Raceways and Fittings
	UL 5C	Surface Raceways and Fittings for Use with Data, Signal, and Control Circuits
	UL 62	Flexible Cords and Cables
	UL 183	Manufactured Wiring Systems
	UL 209	Cellular Metal Floor Raceways and Fittings
	UL 360	Liquid-Tight Flexible Metal Conduit
	UL 857	Busways
	UL 1569	Metal-Clad Cables
	UL 2024	Cable Routing Assemblies and Communications Raceways
605	UL 962	Household and Commercial Furnishings
	UL 1286	Office Furnishings
	UL 1310	Class 2 and Class 3 Power Units
	UL 2999	Individual Commercial Office Furnishings
	UL 5085	Class 2 and Class 3 Transformers
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment - Part 1: Safety Requirements
610	UL 62	Flexible Cords and Cables
	UL Subject 2273	Festoon Cable
620	UL 62	Flexible Cords and Cables
	UL 83	Thermoplastic-Insulated Wires and Cables
	UL 104	Elevator Door Locking Devices and Contacts
	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
	UL 508	Industrial Control Equipment
	UL 508A	Industrial Control Panels

Article	Standard Number	Standard Title
	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	UL 1310	Class 2 Power Units
	UL 1449	Surge Protective Devices
	UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
	UL 2556	Wire and Cable Test Methods
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
625	UL 2202	Electric Vehicle (EV) Charging System Equipment
	UL 2231-1	Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits — Part 1: General Requirements
	UL 2231-2	Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits — Part 2: Particular Requirements for Protection Devices for Use in Charging Systems
	UL 2251	Plugs, Receptacles and Couplers for Electrical Vehicles
	UL 2580	Batteries for Use in Electric Vehicles
	UL 2594	Electric Vehicle Supply Equipment
	UL Subject 9741	Bidirectional Electric Vehicle (EV) Charging System Equipment
626	UL 62	Flexible Cords and Cables
	UL 231	Power Outlets
	UL 498	Attachment Plugs and Receptacles
	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection
	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	UL 817	Cord Sets and Power-Supply Cords
	UL 1686	Pin and Sleeve Configurations
630	UL 551	Transformer-Type Arc-Welding Machines
640	UL 13	Power Limited Circuit Cables
	UL 62	Flexible Cords and Cables
	UL 813	Commercial Audio Equipment
	UL 1310	Class 2 Power Units
	UL 1419	Professional Video and Audio Equipment
	UL 1492	Audio-Video Products and Accessories
	UL 1711	Amplifiers for Fire Protective Signaling Systems
	UL 2269	Outline for Optical Fiber/Communications/Signaling/Coaxial Cable Outlet Boxes
	UL 6500	Audio/Video and Musical Instrument Apparatus for Household, Commercial, and Similar General Use
	UL 60065	Audio, Video and Similar Electronic Apparatus — Safety Requirements
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
645	UL 38	Manual Signaling Boxes for Fire Alarm Systems
	UL 268	Smoke Detectors for Fire Alarm Systems
	UL 444	Communications Cables

Article	Standard Number	Standard Title
	UL 464	Audible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories
	UL 497B	Protectors for Data Communications and Fire Alarm Circuits
	UL 833	Control Units and Accessories for Fire Alarm Systems
	UL 864	Control Units and Accessories for Fire Alarm Systems
	UL 1425	Cables for Power-Limited Fire-Alarm Circuits
	UL 1426	Cables for Non-Power-Limited Fire-Alarm Circuits
	UL 1449	Surge Protective Devices
	UL 1480	Speakers for Fire Alarm and Signaling Systems, Including Accessories
	UL 1638	Visible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories
	UL 1651	Optical Fiber Cable
	UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
	UL 1690	Data-Processing Cable
	UL 1778	Uninterruptible Power Systems
	UL 2024	Cable Routing Assemblies and Communications Raceways
	UL 60950-1	Information Technology Equipment Safety — Part 1: General Requirements
	UL 60950-21	Information Technology Equipment Safety — Part 21: Remote Power Feeding
	UL 60950-22	Information Technology Equipment Safety — Part 22: Equipment to be Installed Outdoors
	UL 60950-23	Information Technology Equipment Safety — Part 23: Large Data Storage Equipment
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
646	UL 10C	Positive Pressure Fire Tests of Door Assemblies
	UL 62	Flexible Cords and Cables
	UL 67	Panelboards
	UL 98	Enclosed and Dead-Front Switches
	UL 305	Panic Hardware
	UL 347	Medium-Voltage AC Contactors, Controllers, and Control Centers
	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
	UL 508	Industrial Control Equipment
	UL 508A	Industrial Control Panels
	UL 845	Motor Control Centers
	UL 869A	Reference Standard for Service Equipment
	UL 891	Switchboards
	UL 891A	Switchboards Rated 601–1000 V
	UL 924	Emergency Lighting and Power Equipment
	UL 977	Fused Power-Circuit Devices
	UL 1008	Transfer Switch Equipment
	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
	UL 1008M	Meter-Mounted Transfer Switches
	UL 1008S	Solid-State Transfer Switches
	UL 1062	Unit Substations

Article	Standard Number	Standard Title
	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	UL 1429	Pullout Switches
	UL 1449	Surge Protective Devices
	UL 1655	Community-Antenna Television Cables
	UL 1989	Standby Batteries
	UL Subject 2755	Modular Data Centers
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
647	UL 1598	Luminaires
650	UL 1310	Class 2 Power Units
	UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
670	ANSI/CSA-C22.2 No. 19085-1	Woodworking machines — Safety — Part 1: Common requirements
	UL 508	Industrial Control Equipment
	UL 61800-5-1	Adjustable Speed Electrical Power Drive Systems — Part 5-1: Safety Requirements — Electrical, Thermal and Energy
	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
	UL 489G	Outline for Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures, 650–1000 Volts AC and 650–1500 Volts DC
675	UL 493	Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables
	UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords
680	UL 6	Electrical Rigid Metal Conduit — Steel
	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	UL 20	General Use Snap-Switches
	UL 62	Flexible Cords and Cables
	UL 360	Liquid-Tight Flexible Metal Conduit
	UL 379	Power Units for Fountain, Swimming Pool, and Spa Luminaires
	UL 467	Grounding and Bonding Equipment
	UL 486D	Sealed Wire Connector Systems
	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	UL 676	Underwater Luminaires and Submersible Junction Boxes
	UL 676A	Potting Compounds for Swimming Pool, Fountain, and Spa Equipment
	UL 943	Ground-Fault Circuit-Interrupters
	UL 943C	Outline for Special Purpose Ground-Fault Circuit-Interrupters
	UL 1004-10	Pool Pump Motors
	UL 1060	Circuit Breaker and Ground Fault Circuit Interrupters
	UL 1081	Swimming Pool Pumps, Filters, and Chlorinators
	UL 1241	Isolated Power Systems Equipment
	UL 1242	Electrical Intermediate Metal Conduit - Steel
	UL 1261	Electric Water Heaters for Pools and Tubs
	UL 1563	Electric Spas, Equipment Assemblies, and Associated Equipment
	UL 1569	Metal-Clad Cables

Article	Standard Number	Standard Title
	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	UL 1795	Hydromassage Bathtubs
	UL 2420	Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
	UL Subject 2452	Outline of Investigation for Electric Swimming Pool and Spa Cover Operators
	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
	UL 2515A	Supplemental Requirements for Extra Heavy Wall Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
	UL 2995	Lifts for Swimming Pools and Spas
	UL 60335-2-1000	Household and Similar Electrical Appliances: Particular Requirements for Electrically Powered Pool Lifts
682	UL 486D	Sealed Wire Connector Systems
	UL 1650	Portable Power Cable
690	UL 98B	Enclosed and Dead-Front Switches for Use in Photovoltaic Systems
	UL 248-19	Low-Voltage Fuses — Photovoltaic Fuses
	UL 467	Grounding and Bonding Equipment
	UL 489B	Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures for Use with Photovoltaic (PV) Systems
	UL Subject 508I	Manual Disconnect Switches Intended for Use in Photovoltaic Systems
	UL 1569	Metal-Clad Cables
	UL 1699B	Photovoltaic DC Arc-Fault Circuit Protection
	UL 1703	Flat-Plate Photovoltaic Modules and Panels
	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources
	UL 2703	Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels
	UL 3001	Distributed Energy Generation and Storage Systems
	UL 3003	Distributed Generation Cables
	UL 3005	Distributed Energy Resource Management Systems
	UL Subject 3703	Solar Trackers
	UL Subject 3730	Photovoltaic Junction Boxes
	UL 3741	Photovoltaic Hazard Control
	UL 4703	Photovoltaic Wire
	UL 6703	Connectors for Use in Photovoltaic Systems
	UL Subject 6703A	Multi-Pole Connectors for Use in Photovoltaic Systems
	UL 7103	Outline for Investigation for Building-Integrated Photovoltaic Roof Coverings
	UL Subject 8703	Concentrator Photovoltaic Modules and Assemblies
	UL 8801	Outline for Photovoltaic-Powered Luminaire Systems
	UL Subject 9703	Distributed Wiring Harnesses
	UL 61730-1	Photovoltaic (PV) Module Safety Qualification — Part 1: Requirements for Construction
	UL 61730-2	Photovoltaic (PV) Module Safety Qualification — Part 2: Requirements for Testing

Article	Standard Number	Standard Title
	UL 62109-1	Power Converters for Use in Photovoltaic Power Systems — Part 1: General Requirements
	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
693		
692	UL 2262	Outline for Fuel Cell Modules for Use in Portable and Stationary Equipment
	UL 2262A	Outline for Borohydride Fuel Cartridges with Integral Fuel Processing for Use with Portable Fuel Cell Power Systems or Similar Equipment
	UL 2265	Fuel Cell Power Units and Fuel Storage Containers for Portable Devices
	UL 2265A	Outline for Hand-held or Hand-Transportable Fuel Cell Power Units with Disposable Methanol Fuel Cartridges for use in Original Equipment Manufacturer's Information Technology Equipment
	UL 2265C	Outline for Hand-Held or Hand-Transportable Alkaline (Direct Borohydride) Fuel Cell Power Units and Borohydride Fuel Cartridges For Use With Consumer Electronics or Information Technology Equipment
	UL 2266	Electromagnetic Compatibility, Electrical Safety, and Physical Protection of Stationary and Portable Fuel Cell Power Systems for Use with Commercial Network Telecommunications Equipment
	UL 2267	Fuel Cell Power Systems for Installation in Industrial Electric Trucks
694	UL 467	Grounding and Bonding Equipment
	UL Subject 489C	Molded-Case Circuit Breakers and Molded-Case Switches for Use with Wind Turbines
	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources
	UL 2227	Outline for Flexible Motor Supply Cable and Wind Turbine Tray Cable
	UL 2736	Outline for Single Pole Separable Interconnecting Cable Connectors for Use with Wind Turbine Generating Systems
	UL 4143	Wind Turbine Generator - Life Time Extension (LTE)
	UL 6141	Wind Turbines Permitting Entry of Personnel
	UL 6142	Wind Turbine Generating Systems — Small
	UL 6171	Wind Turbine Converters and Interconnection Systems Equipment
695	UL 6	Electrical Rigid Metal Conduit — Steel
	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	UL 218	Fire Pump Controllers
	UL 448	Centrifugal Stationary Pumps for Fire-Protection Service
	UL 448B	Residential Fire Pumps Intended for One- and Two-Family Dwellings and Manufactured Homes
	UL 448C	Stationary, Rotary-Type, Positive-Displacement Pumps for Fire Protection Service
	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	UL 1004-5	Fire Pump Motors
	UL 1242	Electrical Intermediate Metal Conduit — Steel
	UL 1569	Metal-Clad Cables
	UL 1724	Outline for Fire Tests for Electrical Circuit Protective Systems
	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables

Article	Standard Number	Standard Title
	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
696		
700	UL 924	Emergency Lighting and Power Equipment
	UL 1008	Transfer Switch Equipment
	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
	UL 1449	Surge Protective Devices
	UL 1724	Outline for Fire Tests for Electrical Circuit Protective Systems
	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
	UL 2200	Stationary Engine Generator Assemblies
701	UL 924	Emergency Lighting and Power Equipment
	UL 1008	Transfer Switch Equipment
	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
702	UL 1008	Transfer Switch Equipment
703		
	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
	UL 1008M	Meter-Mounted Transfer Switches
	UL 1008S	Solid-State Transfer Switches
705	UL 62	Flexible Cords and Cables
	UL 486D	Sealed Wire Connector Systems
	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources
	UL 2200	Stationary Engine Generator Assemblies
	UL 3003	Outline for Distributed Generation Cables
	UL 6142	Small Wind Turbine Systems
	UL 6171	Wind Turbine Converters and Interconnection Systems Equipment
	UL 9540	Energy Storage Systems and Equipment
	UL 62109-2	Power Converters for Use in Photovoltaic Power Systems — Part 2: Particular Requirements for Inverters
706	UL 248-2	Low-Voltage Fuses — Part 2: Class C Fuses
	UL 248-3	Low-Voltage Fuses — Part 3: Class CA and CB Fuses
	UL 248-4	Low-Voltage Fuses — Part 4: Class CC Fuses
	UL 248-5	Low-Voltage Fuses — Part 5: Class G Fuses
	UL 248-6	Low-Voltage Fuses — Part 6: Class H Non-Renewable Fuses
	UL 248-8	Low-Voltage Fuses — Part 8: Class J Fuses
	UL 248-9	Low-Voltage Fuses — Part 9: Class K Fuses
	UL 248-12	Low-Voltage Fuses — Part 12: Class R Fuses
	UL 248-15	Low-Voltage Fuses — Part 15: Class T Fuses
	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
	UL 489H	Outline for Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures, for Use with Direct Current (DC) Microgrids
	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures

Article	Standard Number	Standard Title
	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources
	UL 9540	Energy Storage Systems and Equipment
708	UL 1	Flexible Metal Conduit
	UL 4	Armored Cable
	UL 83	Thermoplastic-Insulated Wires and Cables
	UL 360	Liquid-Tight Flexible Metal Conduit
	UL 493	Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables
	UL 497A	Secondary Protectors for Communications Circuits
	UL 1008	Transfer Switch Equipment
	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
	UL 1008M	Meter-Mounted Transfer Switches
	UL 1008S	Solid-State Transfer Switches
	UL 1569	Metal-Clad Cables
	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
710	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources
712	UL 248-2	Low-Voltage Fuses — Part 2: Class C Fuses
	UL 248-3	Low-Voltage Fuses — Part 3: Class CA and CB Fuses
	UL 248-4	Low-Voltage Fuses — Part 4: Class CC Fuses
	UL 248-5	Low-Voltage Fuses — Part 5: Class G Fuses
	UL 248-6	Low-Voltage Fuses — Part 6: Class H Non-Renewable Fuses
	UL 248-8	Low-Voltage Fuses — Part 8: Class J Fuses
	UL 248-9	Low-Voltage Fuses — Part 9: Class K Fuses
	UL 248-12	Low-Voltage Fuses — Part 12: Class R Fuses
	UL 248-15	Low-Voltage Fuses — Part 15: Class T Fuses
	UL 498G	Outline for Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures, for Use with Direct Current (DC) Microgrids
	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	UL 1670	Medium Voltage Circuit Breakers and Metal-Clad Switchgear
	UL 1671	Medium Voltage Metal-Clad Switchgear
	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources
	UL 6142	Small Wind Turbine Systems
	UL 6171	Wind Turbine Converters and Interconnection Systems Equipment
	UL 9540	Energy Storage Systems and Equipment
	UL 60947-1	Low-Voltage Switchgear and Controlgear — Part 1: General Rules
	UL 60947-4-1	Low-Voltage Switchgear and Controlgear — Part 4-1: Contactors and Motor-Starters — Electromechanical Contactors and Motor-Starters
	UL 62109-2	Power Converters for Use in Photovoltaic Power Systems — Part 2: Particular Requirements for Inverters
725	UL 13	Power-Limited Circuit Cables
	UL 444	Communications Cable
	UL 1012	Power Units Other Than Class 2
	UL 1277	Electrical Power and Control Tray Cables with Optional Optical-Fiber Members

Article	Standard Number	Standard Title
	UL 1310	Class 2 Power Units
	UL 1666	Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts
	UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
	UL 2196	Fire Test for Circuit Integrity of Fire -Resistive Power, Instrumentation, Control and Data Cables
	UL 5085-3	Low Voltage Transformers — Part 3: Class 2 and Class 3 Transformers
	UL Subject 9990	Information and Communication Technology (ICT) Power Cables
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
727	UL 2250	Instrumentation Tray Cable
728	UL 5	Surface Metal Raceways and Fittings
	UL 5A	Nonmetallic Surface Raceways and Fittings
	UL 5B	Strut-Type Channel Raceways and Fittings
	UL 5C	Surface Raceways and Fittings for Use with Data, Signal, and Control Circuits
	UL 209	Cellular Metal Floor Raceways and Fittings
	UL 467	Grounding and Bonding Equipment
	UL 514A	Metallic Outlet Boxes
	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	UL 568	Nonmetallic Cable Tray Systems
	UL 884	Underfloor Raceways and Fittings
	UL Subject 1724	Fire Tests for Electrical Circuit Protective Systems
	UL 2024	Cable Routing Assemblies and Communications Raceways
	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
760	UL 268	Smoke Detectors for Fire Alarm Signaling Systems
	UL 268A	Smoke Detectors for Duct Application
	UL 486C	Splicing Wire Connectors
	UL 497B	Protectors for Data Communication and Fire Alarm Circuits
	UL 1424	Cables for Power-Limited Fire-Alarm Circuits
	UL 1425	Cables for Non–Power-Limited Fire-Alarm Circuits
	UL 1480	Speakers for Fire Alarm and Signaling Systems, Including Accessories
	UL 1666	Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts
	UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
770	UL 467	Grounding and Bonding Equipment
	UL 568	Nonmetallic Cable Tray Systems
	UL 1651	Optical Fiber Cable
	UL 2024	Optical Fiber and Communication Cable Raceway
	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
800	UL 444	Communications Cables

Article	Standard Number	Standard Title
	UL 467	Grounding and Bonding Equipment
	UL 489A	Circuit Breakers for Use in Communication Equipment
	UL 497	Protectors for Paired-Conductor Communications Circuits
	UL 497A	Secondary Protectors for Communications Circuits
	UL 497C	Protectors for Coaxial Communications Circuits
	UL Subject 497E	Protectors for Antenna Lead-In Conductors
	UL Subject 523	Telephone Service Drop Wire
	UL 568	Nonmetallic Cable Tray Systems
	UL 723	Test for Surface Burning Characteristics of Building Materials
	UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords
	UL 1666	Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts
	UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
	UL 1863	Communication Circuit Accessories
	UL 2024	Cable Routing Assemblies and Communications Raceways
	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
805	UL 444	Communications Cables
	UL 497	Protectors for Paired-Conductor Communications Circuits
	UL 497A	Secondary Protectors for Communications Circuits
	UL 497C	Protectors for Coaxial Communications Circuits
	UL Subject 497E	Protectors for Antenna Lead-In Conductors
	UL Subject 523	Telephone Service Drop Wire
	UL 719	Nonmetallic-Sheathed Cables
	UL 1310	Class 2 Power Units
	UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords
	UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
	UL 1863	Communication Circuit Accessories
	UL 2043	Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces
	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
810	UL 150	Antenna Rotators
	UL 452	Antenna-Discharge Units
	UL 467	Grounding and Bonding Equipment
	UL Subject 497E	Protectors for Antenna Lead-In Conductors
820	UL 444	Communications Cables
	UL Subject 497E	Protectors for Antenna Lead-In Conductors
	UL 1655	Community-Antenna Television Cables
830	UL 444	Communications Cables
	UL 497A	Secondary Protectors for Communications Circuits
	UL 497C	Protectors for Coaxial Communications Circuits
	UL Subject 497E	Protectors for Antenna Lead-In Conductors
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements

Article	Standard Number	Standard Title
840	UL 444	Communications Cables
	UL 467	Grounding and Bonding Equipment
	UL 498A	Current Taps and Adapters
	UL 1310	Class 2 Power Units
	UL 1651	Optical Fiber Cable
	UL 1863	Communication Circuit Accessories
	UL 2024	Cable Routing Assemblies and Communications Raceways
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
Tables 11(A) and 11(B)	UL 1310	Class 2 Power Units
	UL 1434	Thermistor-Type Devices
	UL 5085-3	Class 2 and Class 3 Transformers
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
Tables 12(A) and 12(B)	UL 1310	Class 2 Power Units
	UL 1434	Thermistor-Type Devices
	UL 5085-3	Class 2 and Class 3 Transformers
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements

Additional Proposed Changes

File Name	Description	Approved
Annex_A_-_Master_Final.docx	Revised Annex A - Latest/Final	

Statement of Problem and Substantiation for Public Comment

Informational Annex A is updated in the attached document in accordance with the latest revisions to the NEC Style Manual to include the Part 2 standards – ones that do not have an associated listing requirement. In addition, edits and corrections have been made to the Part 1 standards to reflect the appropriate standards where there is an appropriate listing requirement.

Related Item

• First Revisions: 8330, 8327, 8331, 8328, 8326, 8323, 8321, 9160, 8406

Submitter Information Verification

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City:
State:
Zip:
Submittal Date: Tue Aug 17 09:25:50 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action:	Rejected but see related SR
Resolution:	SR-7541-NFPA 70-2021
Statement:	The annex is revised to reference current safety standards. Part 2 has been added to address product safety standards for conductors and equipment that do not have an associated listing requirement

Part 1 – Annex A

Product Safety Standards for Conductors and Equipment that have an Associated Listing Requirement

Article	Standard Number	Standard Title
110	UL 10C	Positive Pressure Fire Tests of Door Assemblies
	UL 305	Panic Hardware
	UL 486D	Sealed Wire Connector Systems
	UL 2043	Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces
	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
210	UL 498	Attachment Plugs and Receptacles
	UL 935	Fluorescent-Lamp Ballasts
	UL 943	Ground Fault Circuit Interrupters
	UL 1029	High-Intensity-Discharge Lamp Ballast
	UL 1699	Arc-Fault Circuit-Interrupters
	UL 1699A	Outlet Branch Circuit AFCIs
225	UL 6	Electrical Rigid Metal Conduit — Steel
	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	UL 360	Liquid-Tight Flexible Metal Conduit
	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	UL 1242	Electrical Intermediate Metal Conduit — Steel
	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
230	UL 6	Electrical Rigid Metal Conduit — Steel
	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	UL 67	Panelboards
	UL 98	Enclosed and Dead-Front Switches
	UL 218	Fire Pump Controllers
	UL 231	Power Outlets
	UL 347	Medium-Voltage AC Contactors, Controllers, and Control Centers
	UL 360	Liquid-Tight Flexible Metal Conduit
	UL 414	Meter Sockets
	UL 486A-486B	Wire Connectors
	UL 486C	Splicing Wire Connectors
	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
	UL 508	Industrial Control Equipment
	UL 508A	Industrial Control Panels

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	UL 514B	Conduit, Tubing and Cable Fittings
	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	UL 845	Motor Control Centers
	UL 857	Busways
	UL 869A	Reference Standard for Service Equipment
	UL 891	Switchboards
	~~UL 891A~~	~~Switchboards Rated 601–1000 V~~
	UL 977	Fused Power-Circuit Devices
	UL 1008	Transfer Switch Equipment
	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
	UL 1008M	Meter-Mounted Transfer Switches
	UL 1008S	Solid-State Transfer Switches
	UL 1053	Ground-Fault Sensing and Relaying Equipment
	UL 1062	Unit Substations
	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	UL 1242	Electrical Intermediate Metal Conduit — Steel
	UL 1429	Pullout Switches
	UL 1449	Surge Protective Devices
	UL 1558	Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear
	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	UL 1740	Robots and Robotic Equipment
	UL 1953	~~Outline for~~ Power Distribution Blocks
	UL 2011	~~Outline for~~ Machinery
	UL 2200	Stationary Engine Generator Assemblies
	UL 2416	Audio/Video, Information and Communication Technology Equipment Cabinet, Enclosure and Rack Systems
	UL 2446	~~Outline for~~ Unitary Boiler Room Systems
	UL 2565	Industrial Metalworking and Woodworking Machine Tools
	UL 2735	Electric Utility Meters
	UL 2745	~~Outline for~~ Meter Socket Adapters for Communications Equipment
	UL 2876	~~Outline for~~ Remote Racking Devices for Switchgear and Controlgear
	UL 4248-1	Fuseholders — Part 1: General Requirements
	UL 60947-1	Low-Voltage Switchgear and Controlgear — Part 1: General Rules
	UL 61800-5-1	Adjustable Speed Electrical Power Drive Systems — Part 5-1: Safety Requirements — Electrical, Thermal and Energy
240		Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
	UL 489	
	UL 489I	Solid State Molded-Case Circuit Breakers
	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	UL 248-1	Low-Voltage Fuses - Part 1: General Requirements

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	UL 248-2	Low-Voltage Fuses — Part 2: Class C Fuses
	UL 248-3	Low-Voltage Fuses — Part 2: Class CA and CB Fuses
	UL 248-4	Low-Voltage Fuses - Part 4: Class CC Fuses
	UL 248-5	Low-Voltage Fuses - Part 5: Class G Fuses
	UL 248-6	Low-Voltage Fuses - Part 6: Class H Non-Renewable Fuses
	UL 248-8	Low-Voltage Fuses - Part 8: Class J Fuses
	UL 248-9	Low-Voltage Fuses - Part 9: Class K Fuses
	UL 248-10	Low-Voltage Fuses - Part 10: Class L Fuses
	UL 248-11	Low-Voltage Fuses - Part 11: Plug Fuses
	UL 248-12	Low-Voltage Fuses - Part 12: Class R Fuses
	UL 248-15	Low-Voltage Fuses - Part 15: Class T Fuses
	UL 248-17	Low-Voltage Fuses - Part 17: Class CF Fuses
	UL 248-18	Low-Voltage Fuses - Part 18: Class CD Fuses
	UL 943	Ground-Fault Circuit-Interrupters
	UL 1053	Ground-Fault Sensing and Relaying Equipment
	UL 4248-1	Fuseholders - Part 1: General Requirements
242	UL 1449	Surge Protective Devices
	UL 1	Flexible Metal Conduit
	UL 4	Armored Cable
	UL 5	Surface Metal Raceways and Fittings
	UL 6	Electrical Rigid Metal Conduit - Steel
	UL 6A	Electrical Rigid Metal Conduit – Aluminum, Red Brass and Stainless Steel
	UL 360	Liquid-Tight Flexible Metal Conduit
	UL 467	Grounding and Bonding Equipment
	UL 486C	Splicing Wire Connectors
	UL 486A-486B	Wire Connectors
	UL 486D	Sealed Wire Connector Systems
	UL 498	Attachment Plugs and Receptacles
	UL 504	Mineral-Insulated, Metal-Sheathed Cable
	UL 514A	Metallic Outlet Boxes
	UL 514B	Conduit, Tubing, and Cable Fittings
	UL 797	Electrical Metallic Tubing - Steel
	UL 797A	Electrical Metallic Tubing - Aluminum
	UL 1242	Electrical Intermediate Metal Conduit - Steel
	UL 1569	Metal-Clad Cables
250	UL 1652	Flexible Metallic Tubing
300	UL 44	Thermoset-Insulated Wires and Cables
	UL 83	Thermoplastic-Insulated Wires and Cables
	UL 83A	Fluoropolymer Insulated Wire

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	UL 2239	Hardware for Support of Conduit, Tubing and Cable
	UL 263	Fire Tests of Building Construction and Materials
	UL 746C~~756C~~	Polymeric Materials — Use in Electrical Equipment Evaluations
	UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords
	UL 2556	~~Standard for~~ Wire and Cable Test Methods
	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
	UL 1569	Metal-Clad Cable
	UL 504	Mineral-Insulated, Metal-Sheathed Cable
	UL 4	Armored Cable
310	UL 44	Thermoset-Insulated Wires and Cables
	UL 83	Thermoplastic-Insulated Wires and Cables
	UL 83A	Fluoropolymer Insulated Wire
	UL 224	Extruded Insulating Tubing
	UL 1063	Machine-Tool Wires and Cables
	UL 1441	Coated Electrical Sleeving
311		Electric Connectors — Connectors for Use between Aluminum-to-Aluminum and Aluminum-to-Copper Conductors Designed for Normal Operation at or Below 93ºC and Copper-to-Copper Conductors Designed for Normal Operation at or Below 100ºC
	ANSI C119.4	
	IEEE 48	IEEE Standard for Test Procedures and Requirements for Alternating-Current Cable Terminations Used on Shielded Cables Having Laminated Insulation Rated 2.5kV through 765 kV or Extruded Insulation Rated 2.5 kV through 500 kV
	IEEE 386	IEEE Standard for Separable Insulated Connector Systems for Power Distribution Systems Rated 2.5 kV through 35 kV
	IEEE 404	IEEE Standard for Extruded and Laminated Dielectric Shielded Cable Joints Rated 2.5 kV to 500 kV
	UL 1072	Medium Voltage Power Cables
	UL 1569	Metal-Clad Cable
	UL 504	Mineral-Insulated, Metal-Sheathed Cable
	UL 4	Armored Cable
312	UL 50	~~Enclosures for Electrical Equipment~~
	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	UL 916	Energy Management Equipment
	UL 2808	Energy Monitoring Equipment
	UL 61010-1 & UL 61010-2-030	Electrical Equipment for Measurement, Control, and Laboratory Use - Part 2-030: Particular Requirements for Testing and Measuring Circuits
314	UL 50	Enclosures for Electrical Equipment
	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations

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	UL 486D	Sealed Wire Connector Systems
	UL 498	Attachment Plugs and Receptacles
	UL 498B	~~Outline for~~ Receptacles with Integral Switching Means
	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection
	UL 514A	Metallic Outlet Boxes
	UL 514B	Conduit, Tubing, and Cable Fittings
	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	UL 514D	Cover Plates for Flush-Mounted Wiring Devices
	UL 1953	Power Distribution Blocks
	UL 4	Armored Cable
	UL 514B	Conduit, Tubing, and Cable Fittings
	UL 2239	Hardware for the Support of Conduit, Tubing, and Cable
	UL 1565	Positioning Devices
	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	UL 44	Thermoset-Insulated Wires and Cables
	UL 83	Thermoplastic-Insulated Wires and Cables
	UL 83A	Fluoropolymer Insulated Wire
320	UL 1063	Machine-Tool Wires and Cables
	~~NEMA Publication No. UC2~~	~~Under-carpet Power Distribution Systems~~
	UL 486A-486B	Wire Connectors
	UL 498	Attachment Plugs and Receptacles
322	UL 514A	Metallic Outlet Boxes
	~~NEMA Publication No. UC2~~	~~Under-carpet Power Distribution Systems~~
	UL 486A-486B	Wire Connectors
324	UL 498	Attachment Plugs and Receptacles
	UL 1569	Metal-Clad Cables
	UL 2225	Cables and Cable-Fittings For Use In Hazardous (Classified) Locations
	UL 514B	Conduit, Tubing, and Cable Fittings
	UL 44	Thermoset-Insulated Wires and Cables
	UL 83	Thermoplastic-Insulated Wires and Cables
	UL 83A	Fluoropolymer Insulated Wire
	UL 1063	Machine-Tool Wires and Cables
	UL 2239	Hardware for the Support of Conduit, Tubing, and Cable
330	UL 1565	Positioning Devices
	UL 66	Fixture Wire

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	UL 504	~~Outline for~~ Mineral-Insulated, Metal-Sheathed Cable
332	UL 514B	Conduit, Tubing and Cable Fittings
	UL 719	Nonmetallic-Sheathed Cables
	UL ~~Subject~~ 2256	Nonmetallic Sheathed Cable Interconnects
334	UL 62275	Cable Management Systems - Cable Ties for Electrical Installations
	UL 1277	Electrical Power and Control Tray Cables with Optional Optical-Fiber Members
	UL 514B	Conduit, Tubing, and Cable Fittings
336	UL 2225	Cables and Cable-Fittings For Use In Hazardous (Classified) Locations
337	UL 1309A	Cable for Use in Mobile Installations
	UL 854	Service-Entrance Cables
338	UL 514B	Conduit, Tubing, and Cable Fittings
	UL 493	Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables
340	UL 514B	Conduit, Tubing, and Cable Fittings
	UL 1242	Electrical Intermediate Metal Conduit — Steel
342	UL 514B	Conduit, Tubing, and Cable Fittings
	UL 6	Electrical Rigid Metal Conduit — Steel
	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
344	UL 514B	Conduit, Tubing, and Cable Fittings
	UL 1	Flexible Metal Conduit
348	UL 62275	Cable Management Systems -- Cable Ties for Electrical Installation
	UL 360	Liquid-Tight Flexible Steel Conduit
	UL 514B	Conduit, Tubing, and Cable Fittings
350	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
353	UL 651A	Schedule 40 and 80 High Density Polyethylene (HDPE) Conduit
354	UL 1990	Nonmetallic Underground Conduit with Conductors

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355	UL 2420	Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
	UL 2515A	Supplemental Requirements for Extra-Heavy Wall Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
356	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
358	UL 514B	Conduit, Tubing, and Cable Fittings
	UL 797	Electrical Metallic Tubing — Steel
	UL 797A	Electrical Metallic Tubing — Aluminum and Stainless Steel
360	UL 514B	Conduit, Tubing, and Cable Fittings
	UL ~~Subject~~ 1652	Flexible Metallic Tubing
362	UL 1653	Electrical Nonmetallic Tubing
	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
366	UL 870	Wireways, Auxiliary Gutters, and Associated Fittings
368	UL 509	Bus Drop Cable
370	ANSI/CSA C22.2 No. 273	Cablebus
374	UL 209	Cellular Metal Floor Raceways and Fittings
	~~UL 360~~	~~Liquid-Tight Flexible Metal Conduit~~
	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
376	UL 870	Wireways, Auxiliary Gutters and Associated Fittings
	UL 1953	Power Distribution Blocks
378	UL 870	Wireways, Auxiliary Gutters, and Associated Fittings
382	UL 5A	Nonmetallic Surface Raceways and Fittings
	UL183	Manufactured Wiring Systems
	UL 467	Grounding and Bonding Equipment
	UL 498	Attachment Plugs and Receptacles
	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection

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	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	UL 498M	Marine Shore Power Inlets
	UL 514D	Cover Plates for Flush-Mounted Wiring Devices
	UL 746C	Polymeric Materials - Use in Electrical Equipment Evaluations
	UL 943	Ground-Fault Circuit-Interrupters
	UL 991	Tests for Safety-Related Controls Employing Solid-State Devices
	UL 1077	Supplementary Protectors for Use in Electrical Equipment
	UL 1699	Arc-Fault Circuit-Interrupters
	UL 1998	Software in Programmable Components
384	UL 5B	Strut-Type Channel Raceways and Fittings
386	UL 5	Surface Metal Raceways and Fittings
388	UL 5A	Nonmetallic Surface Raceways and Fittings
392	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
	UL 13	Power-Limited Circuit Cables
	UL 50	Enclosures for Electrical Equipment, Non-Environmental Considerations
	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	UL 1310	Class 2 ~~and Class 3~~ Power Units ~~Supplies~~
	UL 2043	Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces
393		
	UL 2577	Suspended Ceiling Power Grid Systems and Equipment
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
396	UL 1072	Medium-Voltage Power Cables
	~~UL 62~~	~~Flexible Cords and Cables~~
	~~UL 498~~	~~Attachment Plugs and Receptacles~~
	~~UL 498B~~	~~Outline for Receptacles with Integral Switching Means~~
~~400~~		~~Attachment Plugs, Cord Connectors and Receptacles with~~
	~~UL 498D~~	~~Arcuate (Locking Type) Contacts~~
	~~UL 498E~~	~~Attachment Plugs, Cord Connectors and Receptacles - Enclosure Types for Environmental Protection~~
	~~UL 817~~	~~Cord Sets and Power Supply Cords~~
	~~UL Subject 1650~~	~~Portable Power Cable~~
~~402~~	~~UL 66~~	~~Fixture Wire~~

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	UL 20	General-Use Snap Switches
	UL 98	Enclosed and Dead-Front Switches
	UL ~~Subject~~ 98A	Open-Type Switches
	UL 363	Knife Switches
	UL 489	Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Timers and Time Switches
	UL 773	Plug-In Locking Type Photocontrols for Use with Area Lighting
	UL 773A	Nonindustrial Photoelectric Switches for Lighting Control
	UL 917	Clock-Operated Switches
	UL 977	Fused Power-Circuit Devices
	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	UL 1472	Solid-State Dimming Controls
	UL 1429	Pullout Switches
	UL 60730-1	Automatic Electrical Controls — Part 1: General Requirements
	UL 60730-2	Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Timers and Time Switches
404	UL 60730-2-7	~~Automatic Electrical Controls for Household and Similar~~ Use; Part 2: Particular Requirements for Timers and Time Switches
	ANSI/NEMA WD 6–2016	Wiring Devices — Dimensional Specifications.
	UL 498	Attachment Plugs and Receptacles
	UL 498B	Receptacles with Integral Switching Means
	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	UL 498E	Attachment Plugs, Cord Connectors and Receptacles - Enclosure Types for Environmental Protection
	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	UL 498M	Marine Shore Power Inlets
	UL 514A	Metallic Outlet Boxes
	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
406	UL 514D	Cover Plates for Flush-Mounted Wiring Devices
	UL 943	Ground-Fault Circuit-Interrupters
	UL 943B	Appliance Leakage-Current Interrupters
	UL 943C	~~Outline for~~ Special Purpose Ground-Fault Circuit-Interrupters
	UL 970	Retail Fixtures and Merchandising Displays
	UL 1286	Office Furnishings Systems
	UL 1310	Class 2 ~~and Class 3~~ Power Units
	UL 1682	Plugs, Receptacles, and Cable Connectors, of the Pin and Sleeve Type
	UL 1691	Single Pole Locking-Type Separable Connectors
	UL 1699	Arc-Fault Circuit-Interrupters
	UL 2999	Individual Commercial Office Furnishings

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	UL 44	Thermoset-Insulated Wires and Cables
	UL 67	Panelboards
	UL 891	Switchboards
	UL 1558	Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear
	~~UL 60947-1~~	~~Low-Voltage Switchgear and Controlgear — Part 1: General Rules~~
	~~UL 60947-4-1~~	~~Low-Voltage Switchgear and Controlgear — Part 4-1: Contactors and Motor-Starters — Electromechanical Contactors and Motor-Starters~~
	~~UL 60947-4-2~~	~~Voltage Switchgear and Controlgear — Part 4-2: Contactors and Motor-Starters — AC Semiconductor Motor Controllers and Starters~~
	~~UL 60947-5-1~~	~~Low-Voltage Switchgear and Controlgear — Part 5-1: Control Circuit Devices and Switching Elements — Electromechanical Control Circuit Devices~~
408		~~Low-Voltage Switchgear and Controlgear — Part 5-2:~~
	~~UL 60947-5-2~~	~~Control Circuit Devices and Switching Elements — Proximity Switches~~
	~~UL 60947-7-1~~	~~Low-Voltage Switchgear and Controlgear — Part 7-1: Ancillary Equipment — Terminal Blocks for Copper Conductors~~
	~~UL 60947-7-2~~	~~Low-Voltage Switchgear and Controlgear — Part 7-2: Ancillary Equipment — Protective Conductor Terminal Blocks for Copper Conductors~~
	~~UL 60947-7-3~~	~~Low-Voltage Switchgear and Controlgear — Part 7-3: Ancillary Equipment — Safety Requirements for Fuse Terminal Blocks~~
409	UL 508	Industrial Control Equipment
	UL 508A	Industrial Control Panels
	ANSI/CSA-C22.2 No. 184.2	Solid-State Controls for Lighting Systems (SSCLS)
410	UL 153	Portable Electric Luminaires
	UL 496	Lampholders
	UL 498	Attachment Plugs and Receptacles
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	UL 1389	Plant Oil Extraction Equipment for Installation and Use in Ordinary (Unclassified) Locations and Hazardous (Classified) Locations
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	UL 60079-28	Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation.
	UL 60079-29-1	Explosive Atmospheres — Part 29-1: Gas Detectors — Performance Requirements of Detectors for Flammable Gases
	UL 60079-29-4	Explosive Atmospheres - Part 29-4: Gas Detectors - Performance Requirements of Open Path Detectors for Flammable Gases
	UL 60079-30-1	~~Explosive Atmospheres — Electrical Resistance Trace Heating — General and Testing Requirements~~ Part 30-1: Electrical Resistance Trace Heating - General and Testing Requirements
	UL 121201	Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations
	UL 122001	General Requirements for Electrical Ignition Systems for Internal Combustion Engines in Class I, Division 2 or Zone 2, Hazardous (Classified) Locations
	UL 122701	Requirements for Process Sealing Between Electrical Systems and Potentially Flammable or Combustible Process Fluids
	NFPA 33	Standard for Spray Application Using Flammable or Combustible Materials
	NFPA 34	Dipping, Coating, and Printing Processes Using Flammable or Combustible Liquids
	~~ISA 12.12.01~~	~~Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations~~
	NFPA 496	Purged and Pressurized Enclosures for Electrical Equipment
	~~UL 1~~	~~Flexible Metal Conduit~~
	~~UL 13~~	~~Power Limited Circuit Cables~~
	~~UL 248-2~~	~~Low-Voltage Fuses — Part 2: Class C Fuses~~
	~~UL 248-3~~	~~Low-Voltage Fuses — Part 3: Class CA and CB Fuses~~
	~~UL 248-4~~	~~Low-Voltage Fuses — Part 4: Class CC Fuses~~
	~~UL 248-5~~	~~Low-Voltage Fuses — Part 5: Class G Fuses~~
	~~UL 248-6~~	~~Low-Voltage Fuses — Part 6: Class H Non-Renewable Fuses~~
	~~UL 248-8~~	~~Low-Voltage Fuses — Part 8: Class J Fuses~~
	~~UL 248-9~~	~~Low-Voltage Fuses — Part 9: Class K Fuses~~
501	~~UL 248-12~~	~~Low-Voltage Fuses — Part 12: Class R Fuses~~
	~~UL 248-15~~	~~Low-Voltage Fuses — Part 15: Class T Fuses~~
	~~UL 467~~	~~Grounding and Bonding Equipment~~
	~~UL 504~~	~~Outline for Mineral-Insulated, Metal-Sheathed Cable~~

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	UL 674	Electric Motors and Generators for Use in Hazardous (Classified) Locations
	UL 783	Electric Flashlights and Lanterns for Use in Hazardous (Classified) Locations
	UL 823	~~Standard for~~ Electric Heaters For Use in Hazardous (Classified) Locations
	UL 844	Luminaires for Use in Hazardous (Classified) Locations
	UL 1072	Medium-Voltage Power Cables
	UL 1203	Explosionproof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations
	UL 1277 ~~1272~~	Electrical Power and Control Tray Cables with Optional Optical-Fiber Members
	UL 1309A	~~P-Cables~~ Cable for Use in Mobile Applications
	~~UL 1389~~	~~Standard for Plant Oil Extraction Equipment for Installation and Use in Ordinary (Unclassified) Locations and Hazardous (Classified) Locations~~
	~~UL 1569~~	~~Metal-Clad Cables~~
	UL 1836	~~Outline of Investigation for~~ Electric Motors and Generators for Use in Class I, Division 2, Class I, Zone 2, Class II, Division 2 and Zone 22 Hazardous (Classified) Locations
	~~UL 2011 (Part 3)~~	~~Outline of Investigation for Machinery~~
	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
	~~UL 2515A~~	~~Supplemental Requirements for Extra Heavy Wall Reinforced Thermosetting Resin Conduit (RTRC) and Fittings~~
	~~UL 2874~~	~~Outline of Investigation for Electric Motors for Use in Hazardous (Classified) Locations - Protection by Pressurized Atmosphere Maintained above the UFL~~
	~~UL 4300~~	~~Outline of Investigation for Electrically Heated Insulated Covers for Compressed Gas Cylinders for Use in Hazardous (Classified) Locations~~
	UL 60079-28	Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation
	UL 60079-29-1	Explosive Atmospheres — Part 29-1: Gas Detectors — Performance Requirements of Detectors for Flammable Gases
	UL 60079-29-4	Explosive Atmospheres — Part 29-4: Gas Detectors — Performance Requirements of Open Path Detectors for Flammable Gases
	UL 60079-30-1	~~Explosive Atmospheres — Electrical Resistance Trace Heating — General and Testing Requirements~~ Part 30-1: Electrical Resistance Trace Heating - General and Testing Requirements
	UL 121201	Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations
	~~UL 121303~~	~~Guide for Combustible Gas Detection as a Method of Protection~~
	UL 122001	General Requirements for Electrical Ignition Systems for Internal Combustion Engines in Class I, Division 2 or Zone 2, Hazardous (Classified) Locations
	UL 122701	Requirements for Process Sealing Between Electrical Systems and ~~Potentially~~ Flammable or Combustible Process Fluids
	IEEE 844.1	Skin Effect Trace Heating of Pipelines, Vessels, Equipment, and Structures - General, Testing, Marking, and Documentation Requirements

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	IEEE 1349	Guide for the Application of Electric Motors in Class I, Division 2 and Class I, Zone 2 Hazardous (Classified) Locations
	NFPA 496	Purged and Pressurized Enclosures for Electrical Equipment
	~~UL 13~~	~~Power Limited Circuit Cables~~
	UL 674	Electric Motors and Generators for Use in Hazardous (Classified) Locations
	UL 783	Electric Flashlights and Lanterns for Use in Hazardous (Classified) Locations
	UL 823	~~Standard for~~ Electric Heaters For Use in Hazardous (Classified) Locations
	UL 844	Luminaires for Use in Hazardous (Classified) Locations
	UL 1203	Explosionproof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations
	UL 1309A	~~Marine Shipboard Cable~~ Cable for Mobile Installations
	UL 1836	~~Outline of Investigation for~~ Electric Motors and Generators for Use in Class I, Division 2, Class I, Zone 2, Class II, Division 2 and Zone 22 Hazardous (Classified) Locations.
	~~UL 2011 (Part 3)~~	~~Outline of Investigation for Machinery~~
	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
	~~UL 2250~~	~~Instrumentation Tray Cable~~
502	UL 60079-28	Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation.
	UL 60079-30-1	~~Explosive Atmospheres — Electrical Resistance Trace Heating — General and Testing Requirements~~ Part 30-1: Electrical Resistance Trace Heating - General and Testing Requirements
	UL 121201	Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations
	IEEE 844.1	Skin Effect Trace Heating of Pipelines, Vessels, Equipment, and Structures - General, Testing, Marking, and Documentation Requirements
	~~UL 13~~	~~Power Limited Circuit Cables~~
	UL 823	~~Standard for~~ Electric Heaters For Use in Hazardous (Classified) Locations
	UL 844	Luminaires for Use in Hazardous (Classified) Locations
	~~UL 1203~~	~~Explosionproof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations~~
	UL 1836	~~Outline of Investigation for~~ Electric Motors and Generators for Use in Class I, Division 2, Class I, Zone 2, Class II, Division 2 and Zone 22 Hazardous (Classified) Locations
	~~UL 2225~~	~~Cable and Cable Fittings for Use in Hazardous (Classified) Locations~~
	~~UL 2250~~	~~Instrumentation Tray Cable~~
503	UL 60079-30-1	Explosive Atmospheres — Electrical Resistance Trace Heating — General and Testing Requirements
	UL 121201	Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations
	IEEE 844.1	Skin Effect Trace Heating of Pipelines, Vessels, Equipment, and Structures - General, Testing, Marking, and Documentation Requirements

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	UL 698A	~~Standard for~~ Industrial Control Panels Relating to Hazardous (Classified) Locations
504	UL 913	Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous (Classified) Locations
	UL 120202	Recommendations for the Preparation, Content, and Organization of Intrinsic Safety Control Drawings
	IEEE 844.1	Skin Effect Trace Heating of Pipelines, Vessels, Equipment, and Structures — General, Testing, Marking, and Documentation Requirements
	IEEE 1349	Guide for the Application of Electric Motors in Class I, Division 2 and Class I, Zone 2 Hazardous (Classified) Locations
	~~UL 13~~	~~Power Limited Circuit Cables~~
	~~UL 674~~	~~Electric Motors and Generators for Use in Hazardous (Classified) Locations~~
	UL 698A	Industrial Control Panels Relating to Hazardous (Classified) Locations
	~~UL 1203~~	~~Explosionproof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations~~
	UL 1309A	~~Marine Shipboard Cable~~ Cable for Mobile Installations
	~~UL 1389~~	~~Standard for Plant Oil Extraction Equipment for Installation and Use in Ordinary (Unclassified) Locations and Hazardous (Classified) Locations~~
	~~UL 2011 (Part 3)~~	~~Outline of Investigation for Machinery~~
	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
	~~UL 2250~~	~~Instrumentation Tray Cable~~
	~~UL 2874~~	~~Outline for Electric Motors for Use in Hazardous (Classified) Locations — Protection by Pressurized Atmosphere Maintained above the UFL~~
	UL 60079-0	Explosive ~~Gas~~ Atmospheres — Part 0: Equipment — General Requirements
	UL 60079-1	~~Explosive Gas Atmospheres — Part 1: Type of Protection — Flameproof "d"~~ Explosive Atmospheres - Part 1: Equipment Protection by Flameproof Enclosures "d"
	UL 60079-2	~~Standard for~~ Explosive Atmospheres — Part 2: Equipment protection by pressurized enclosure "p"
	UL 60079-5	Explosive Gas Atmospheres — Part 5: Type of Protection — Powder Filling "q"
	UL 60079-6	~~Standard for~~ Explosive Atmospheres — Part 6: Equipment Protection by Liquid Immersion "o"
	UL 60079-7	~~Explosive Gas Atmospheres — Part 7: Increased Safety "e"~~ Explosive Atmospheres- Part 7: Equipment Protection by Increased Safety "e"
	UL 60079-10-1	~~Part 10-1: Classification of Areas — Explosive Gas Atmospheres~~ Explosive Atmospheres - Part 10-1: Classification of Areas - Explosive Gas Atmospheres
	UL 60079-11	Explosive Atmospheres — Part 11: Equipment Protection by Intrinsic Safety "i"
	UL 60079-13	~~Standard for~~ Explosive Atmospheres — Part 13: Equipment Protection by Pressurized Room "p" and Artificially Ventilated Room "v"
505	UL 60079-15	~~Electrical Apparatus for Explosive Gas Atmospheres — Part 15: Type of Protection "n"~~

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		Explosive Atmospheres - Part 15: Equipment Protection by Type of Protection "n"
		~~Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection — Encapsulation "m"~~
	UL 60079-18	Explosive Atmospheres - Part 18: Equipment Protection by Encapsulation "m"
	UL 60079-25	Explosive Atmospheres — Part 25: Intrinsically Safe Electrical Systems
	UL 60079-26	~~Standard for~~ Explosive Atmospheres — Part 26: Equipment with Equipment Protection Level (EPL) Ga
	UL 60079-28	~~Standard for~~ Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation
	UL 60079-29-1	Explosive Atmospheres — Part 29-1: Gas Detectors — Performance Requirements of Detectors for Flammable Gases
	UL 60079-29-4	Explosive Atmospheres — Part 29-4: Gas Detectors — Performance Requirements of Open Path Detectors for Flammable Gases
	UL 60079-30-1	~~Standard for~~ Explosive Atmospheres — Part 30-1: Electrical Resistance Trace Heating - General and Testing Requirements
	UL 60079-33	Explosive Atmospheres – Part 33: Equipment Protection by Special Protection "s"
	UL 80079-36	Explosive Atmospheres – Part 36: Non-Electrical Equipment for Explosive Atmospheres - Basic Method and Requirements
	UL80079-37	Explosive Atmospheres – Part 37: Non-Electrical Equipment for Explosive Atmospheres - Non Electrical Type of Protection Constructional Safety "c", Control of Ignition Source "b" Liquid Immersion "k"
	~~UL 122001~~	~~General Requirements for Electrical Ignition Systems for Internal Combustion Engines in Class I, Division 2 or Zone 2, Hazardous (Classified) Locations~~
	UL 122701	Requirements for Process Sealing Between Electrical Systems and Flammable or Combustible Process Fluids
	IEEE 844.1	Skin Effect Trace Heating of Pipelines, Vessels, Equipment, and Structures — General, Testing, Marking, and Documentation Requirements
	~~UL 13~~	~~Power Limited Circuit Cables~~
	~~UL 1277~~	~~Electrical Power and Control Tray Cables with Optional Optical Fiber Members~~
	~~UL 2011 (Part 3)~~	~~Outline of Investigation for Machinery~~
	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
	UL 698A	Industrial Control Panels Relating to Hazardous (Classified) Locations
	UL 60079-0	Explosive ~~Gas~~ Atmospheres — Part 0: Equipment — General Requirements
	UL 60079-2	~~Standard for~~ Explosive atmospheres — Part 2: Equipment protection by pressurized enclosure 'p'
	~~UL 60079-10-2~~	~~Part 10-2: Classification of Areas — Combustible Dust Atmospheres~~
	UL 60079-11	Explosive Atmospheres — Part 11: Equipment Protection by Intrinsic Safety "i"
		~~Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection — Encapsulation "m"~~
506	UL 60079-18	Explosive Atmospheres - Part 18: Equipment Protection by Encapsulation "m"

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	UL 60079-25	Explosive Atmospheres — Part 25: Intrinsically Safe Electrical Systems
	UL 60079-28	Standard for Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation
	UL 60079-30-1	Explosive Atmospheres — Electrical Resistance Trace Heating — General and Testing Requirements Part 30-1: Electrical Resistance Trace Heating - General and Testing Requirements
	UL 60079-31	Explosive Atmospheres — Part 31: Equipment Dust Ignition Protection by Enclosure “t”
	UL 60079-33	Explosive Atmospheres – Part 33: Equipment Protection by Special Protection “s”
	UL 80079-36	Explosive Atmospheres – Part 36: Non-Electrical Equipment for Explosive Atmospheres - Basic Method and Requirements
	UL80079-37	Explosive Atmospheres – Part 37: Non-Electrical Equipment for Explosive Atmospheres - Non Electrical Type of Protection Constructional Safety "c", Control of Ignition Source "b" Liquid Immersion "k"
	UL 62784	Vacuum Cleaners and Dust Extractors Providing Equipment Protection Level Dc for the Collection of Combustible Dusts — Particular Requirements
511	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
	UL 122701	Requirements for Process Sealing Between Electrical Systems and Flammable or Combustible Process Fluids
512	UL 1389	Plant Oil Extraction Equipment for Installation and Use in Ordinary (Unclassified) Locations and Hazardous (Classified) Locations
514	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
	UL 122701	Requirements for Process Sealing Between Electrical Systems and Flammable or Combustible Process Fluids
515	UL 844	Luminaires for Use in Hazardous (Classified) Locations
	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
	NFPA 33	Combustible Materials
	NFPA 34	Dipping, Coating, and Printing Processes Using Flammable or Combustible Liquids
516	UL 844	Luminaires for Use in Hazardous (Classified) Locations
517	AAMI ES60601-1	Medical electrical equipment— Part 1: General requirements for basic safety and essential performance
	ES 60601-1	AAMI Medical Electrical Equipment — Part 1: General Requirements for Basic Safety and Essential Performance
	UL 5	Surface Metal Raceways and Fittings
	UL 5A	Nonmetallic Surface Raceways and Fittings
	UL 467	Grounding and Bonding Equipment
	UL 498	Attachment Plugs and Receptacles

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	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection
	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	UL 1022	Line Isolation Monitors
	UL 1047	Isolated Power Systems Equipment
	UL 1286	Office Furnishing Systems
	UL 2930	Cord-and-Plug-connected Health Care Facility Outlet Assemblies
	UL 60601-1	Medical Electrical Equipment — Part 1: General Requirements for Safety
	UL 122701	Requirements for Process Sealing Between Electrical Systems and Flammable or Combustible Process Fluids
	UL 498	Attachment Plugs and Receptacles
	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection
518	~~Plugs, Socket-Outlets and Couplers with Arcuate (Locking~~	~~Type) Contacts~~
	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	UL 943	Ground-Fault Circuit-Interrupters
	UL 943C	~~Outline for~~ Special Purpose Ground-Fault Circuit-Interrupters
	UL 2305	Exhibition Display Units, Fabrication and Installation
	UL 2305A	Convention Center Cord Sets
	UL 62	Flexible Cords and Cables
520	UL ~~Subject~~ 334	Theater Lighting Distribution and Control Equipment
	UL 1573	Stage and Studio Luminaires and Connector Strips
	UL 1640	Portable Power-Distribution Equipment
	UL 1691	Single Pole Locking-Type Separable Connectors
	UL 13	Power Limited Circuit Cables
522	UL 1063	~~Machine-Tool Wires and Cables~~
	UL 2250	Instrumentation Tray Cable
	UL 62	Flexible Cords and Cables
	UL 817	Cord Sets and Power-Supply Cords
525	UL 943	~~Ground-Fault Circuit-Interrupters~~
	UL 943C	~~Outline for~~ Special Purpose Ground-Fault Circuit-Interrupters
	UL 1691	Single Pole Locking-Type Separable Connectors
530	UL 62	Flexible Cords and Cables
	UL 1479	Fire Tests of Penetration Firestops
	UL 1573	Stage and Studio Luminaires and Connector Strips

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	UL 1680	~~Outline for~~ Stage and Lighting Cables
	UL 1691	Single Pole Locking-Type Separable Connectors
	UL 1836	~~Outline of Investigation for~~ Electric Motors and Generators for Use in Class I, Division 2, Class I, Zone 2, Class II, Division 2 and Zone 22 Hazardous (Classified) Locations
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment - Part 1: Safety Requirements
540	UL 62368-1	Audio/Video, Information and Communication Technology Equipment - Part 1: Safety Requirements
	UL 5	Surface Metal Raceways and Fittings
	UL 5A	Nonmetallic Surface Raceways and Fittings
	UL 5B	Strut-Type Channel Raceways and Fittings
	UL 5C	Surface Raceways and Fittings for Use with Data, Signal, and Control Circuits
	UL 20	General Use Snap Switches
	UL 209	Cellular Metal Floor Raceways and Fittings
545		
	UL 498	~~Attachment~~ Plugs and Receptacles
	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection
	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	UL 514A	Metallic Outlet Boxes
	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	UL 2024	Cable Routing Assemblies and Communications Raceways
	UL 50	Enclosures for Electrical Equipment, Non-Environmental Considerations
	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	UL 62	Flexible Cords and Cables
547	UL 514A	Metallic Outlet Boxes
	UL 514B	Conduit, Tubing, and Cable Fittings
	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	UL 1598	Luminaires
	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
550	UL 6	Electrical Rigid Metal Conduit - Steel
	UL 6A	Electrical Rigid Metal Conduit - Aluminum, Red Brass and Stainless Steel
	UL 83	Thermoplastic-Insulated Wires and Cables
	~~UL 234~~	~~Low Voltage Lighting Fixtures for Use in Recreational Vehicles~~
	UL 307A	Liquid Fuel-Burning Heating Appliances for Manufactured Homes and Recreational Vehicles
	UL 307B	Gas-Burning Heating Appliances for Manufactured Homes and Recreational Vehicles
	UL 360	Liquid-Tight Flexible Metal Conduit

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	UL 467	Grounding and Bonding Equipment
	UL 498	Attachment Plugs and Receptacles
	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	UL 498E	Attachment Plugs, Cord Connectors and Receptacles - Enclosure Types for Environmental Protection
	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	UL 817	Cord Sets and Power-Supply Cords
	UL 1242	Electrical Intermediate Metal Conduit — Steel
	UL ~~Subject~~ 1462	Mobile Home Pipe Heating Cable
	UL 1598	Luminaires
	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	UL 2108	Low-Voltage Lighting Systems
	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
	UL 6	Electrical Rigid Metal Conduit — Steel
	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	UL 62	Flexible Cords and Cables
	UL 231	Power Outlets
	UL 234	Low Voltage Lighting Fixtures for use in Recreational Vehicles
	UL 360	Liquid-Tight Flexible Metal Conduit
	UL 467	Grounding and Bonding Equipment
	UL 486C	Splicing Wire Connectors
	UL 498	Attachment Plugs and Receptacles
551	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection
	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	UL 514A	Metallic Outlet Boxes
	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	UL 514D	Cover Plates for Flush-Mounted Wiring Devices
	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	UL 817	Cord Sets and Power-Supply Cords
	UL 943	Ground-Fault Circuit-Interrupters
	UL 1004-4	Electric Generators
	UL 1008	Transfer Switch Equipment
	UL 1008M	~~Outline for~~ Transfer Switch Equipment, Meter Mounted
	UL 1008S	Solid-State Transfer Switches
	UL 1242	Electrical Intermediate Metal Conduit — Steel
	UL 1449	Surge Protective Devices
	UL 1598	Luminaires

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	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	UL 2200	Stationary Engine Generator Assemblies
	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
	UL 60730-1	Automatic Electrical Controls; Part 1: General Requirements
	UL 60730-2-9	Automatic Electrical Controls; Part 2: Particular Requirements for Temperature Sensing Controls
552	SAE J1128-2015	Low Voltage Primary Cable, for Types GXL, HDT, and SXL
	SAE J1127-2015	Low Voltage Battery Cable, for Types SGT and SGR
	UL 6	Electrical Rigid Metal Conduit — Steel
	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	UL 50	Enclosures for Electrical Equipment, Non-Environmental Considerations
	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	UL 62	Flexible Cords and Cables
	UL 67	Panelboards
	UL 231	Power Outlets
	UL 234	Low Voltage Lighting Fixtures for Use in Recreational Vehicles
	UL 360	Liquid-Tight Flexible Metal Conduit
	UL 430	Waste Disposers
	UL 467	Grounding and Bonding Equipment
	UL 514A	Metallic Outlet Boxes
	UL 514B	Conduit, Tubing, and Cable Fittings
	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	UL 817	Cord Sets and Power-Supply Cords
	UL 916	Energy Management Equipment
	UL 943	Ground-Fault Circuit-Interrupters
	UL 1004-4	Electric Generators
	UL 1242	Electrical Intermediate Metal Conduit — Steel
	UL 1563	Electric Spas, Equipment Assemblies, and Associated Equipment
	UL 1598	Luminaires
	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	UL 2108	Low Voltage Lighting Systems
	UL 2200	Stationary Engine Generator Assemblies
	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
555	UL 6	Electrical Rigid Metal Conduit — Steel
	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	UL 231	Power Outlets
	UL 486D	Sealed Wire Connector Systems

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	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	UL 676	Underwater Luminaires and Submersible Junction Boxes
	UL 943	Ground-Fault Circuit-Interrupters
	UL 1053	Ground-Fault Sensing and Relaying Equipment
	UL 1650	Portable Power Cable
	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
	UL 496	Lampholders
	UL 514B	Conduit, Tubing, and Cable Fittings
	UL 588	Seasonal and Holiday Decorative Products
	UL 817	Cord Sets
	UL 943	Ground-Fault Circuit-Interrupters
590	UL 1088	Temporary Lighting Strings
	UL 1377	~~Outline for~~ Wire used in Low Voltage Seasonal Lighting Products In Circuits With a Maximum Available Power of 15W
	~~UL 1838~~	~~Low Voltage Landscape Lighting Systems~~
	~~UL 2108~~	~~Low Voltage Lighting Systems~~
	UL 1	Flexible Metal Conduit
	UL 5	Surface Metal Raceways and Fittings
	UL 5A	Nonmetallic Surface Raceways and Fittings
	UL 13	Power-Limited Circuit Cables
	UL 48	Electric Signs
	UL 50	Enclosures for Electrical Equipment, Non-Environmental Considerations
	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	UL 98B	~~Outline for~~ Enclosed and Dead-Front Switches for Use in Photovoltaic Systems
	UL 248-19	Low-Voltage Fuses — Part 19: Photovoltaic Fuses
	UL 360	Liquid-Tight Flexible Metal Conduit
	UL 489B	Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures For Use With Photovoltaic (PV) Systems
	UL 508I	~~Outline for~~ Disconnect Switches Intended for Use in Photovoltaic Systems
	UL 814	Gas-Tube-Sign Cable
	UL 879	Electric Sign Components
	UL 879A	LED Sign and Sign Retrofit Kits
	UL ~~Subject~~ 879B	Polymeric Enclosure Systems for the Splice Between Neon Tubing Electrode Leads and GTO Cable, and the GTO Cable Leading to the Splice
600	UL 943	Ground-Fault Circuit-Interrupters
	UL 1310	Class 2 ~~and Class 3~~ Power Units
	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	UL 1699B	Photovoltaic (PV) DC Arc-Fault Circuit Protection

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	UI 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources
	UL 2161	Neon Transformers and Power Supplies
	UL 2703	Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels
	UL 3001	Distributed Energy Generation and Storage Systems
	UL 3003	~~Outline for~~ Distributed Generation Cables
	UL 3703	Solar Trackers
	UL 4703	Photovoltaic Wire
	UL 6703	Connectors for Use in Photovoltaic Systems
	UL 7103	~~Outline for~~ Investigation for Building-Integrated Photovoltaic Roof Coverings
	UL 8703	~~Outline for~~ Concentrator Photovoltaic Modules and Assemblies
	~~UL 8801~~	~~Outline for Photovoltaic-Powered Luminaire Systems~~
	UL 9703	~~Outline for~~ Distributed Generation Wiring Harnesses
	UL 61730-1	Photovoltaic (PV) Module Safety Qualification — Part 1: Requirements For Construction
	UL 61730-2	Photovoltaic (PV) Module Safety Qualification — Part 2: Requirements For Testing
	UL 62109	Power Converters for Use in Photovoltaic Power Systems — Part 1: General Requirements
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
604	UL 1	Flexible Metal Conduit
	UL 4	Armored Cable
	UL 5	Surface Metal Raceways and Fittings
	UL 5A	Nonmetallic Surface Raceways and Fittings
	UL 5B	Strut-Type Channel Raceways and Fittings
	UL 5C	Surface Raceways and Fittings for Use with Data, Signal, and Control Circuits
	UL 62	Flexible Cords and Cables
	UL 183	Manufactured Wiring Systems
	UL 209	Cellular Metal Floor Raceways and Fittings
	UL 360	Liquid-Tight Flexible Metal Conduit
	UL 797	Electrical Metallic Tubing - Steel
	UL 797A	Electrical Metallic Tubing - Aluminum and Stainless Steel
	UL 857	Busways
	UL 1569	Metal-Clad Cables
	UL 2024	Cable Routing Assemblies and Communications Raceways
605	UL 962	Household and Commercial Furnishings
	UL 1286	Office Furnishings Systems
	UL 1310	Class 2 ~~and Class 3~~ Power Units
	UL 2999	Individual Commercial Office Furnishings
	UL 5085-3	~~Class 2 and Class 3 Transformers~~

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		Low Voltage Transformers - Part 3: Class 2 and Class 3 Transformers
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment - Part 1: Safety Requirements
610	UL 62	Flexible Cords and Cables
	UL ~~Subject~~ 2273	Festoon Cable
620	UL 62	Flexible Cords and Cables
	UL 83	Thermoplastic-Insulated Wires and Cables
	UL 98	Enclosed and Dead-Front Switches
	UL 104	Elevator Door Locking Devices and Contacts
	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
	UL 508	Industrial Control Equipment
	UL 508A	Industrial Control Panels
	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	UL 1310	Class 2 Power Units
	UL 1449	Surge Protective Devices
	UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
	UL 2556	Wire and Cable Test Methods
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
625	UL 2202	Electric Vehicle (EV) Charging System Equipment
	UL 2231-1	Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits — Part 1: General Requirements
	UL 2231-2	Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits — Part 2: Particular Requirements for Protection Devices for Use in Charging Systems
	UL 2251	Plugs, Receptacles and Couplers for Electrical Vehicles
	UL 2580	Batteries for Use in Electric Vehicles
	UL 2594	Electric Vehicle Supply Equipment
	~~Bidirectional Electric Vehicle (EV) Charging System Equipment~~	
	UL ~~Subject~~ 9741	Electric Vehicle Power Export Equipment (EVPE)
	UL 62	Flexible Cords And Cables
	UL 1650	Portable Power Cable
626	UL 62	Flexible Cords and Cables
	UL 231	Power Outlets
	UL 498	Attachment Plugs and Receptacles
	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection
	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts

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	UL 817	Cord Sets and Power-Supply Cords
	UL 1686	Pin and Sleeve Configurations
	UL 1651	Optical Fiber Cable
630	UL 551	Transformer-Type Arc-Welding Machines
	UL 13	Power Limited Circuit Cables
	UL 62	Flexible Cords and Cables
	UL 813	Commercial Audio Equipment
	UL 1310	Class 2 Power Units
	UL 1419	Professional Video and Audio Equipment
640	UL 1492	Audio-Video Products and Accessories
	UL 1711	Amplifiers for Fire Protective Signaling Systems
	UL 2269	~~Outline for~~ Optical Fiber/Communications/Signaling/Coaxial Cable Outlet Boxes
	UL 6500	Audio/Video and Musical Instrument Apparatus for Household, Commercial, and Similar General Use
	UL 60065	Audio, Video and Similar Electronic Apparatus — Safety Requirements
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
	UL 38	Manual Signaling Boxes for Fire Alarm Systems
	UL 268	Smoke Detectors for Fire Alarm Systems
	UL 444	Communications Cables
	UL 464	Audible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories
	UL 497B	Protectors for Data Communications and Fire Alarm Circuits
	UL 833	Control Units and Accessories for Fire Alarm Systems
	UL 864	Control Units and Accessories for Fire Alarm Systems
	UL 1424 ~~1425~~	Cables for Power-Limited Fire-Alarm Circuits
	UL 1425 ~~1426~~	Cables for Non-Power-Limited Fire-Alarm Circuits
	UL 1449	Surge Protective Devices
	UL 1480	Speakers for Fire Alarm and Signaling Systems, Including Accessories
	UL 1638	Visible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories
	UL 1651	Optical Fiber Cable
645	UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
	UL 1690	Data-Processing Cable
	UL 1778	Uninterruptible Power Systems
	UL 2024	Cable Routing Assemblies and Communications Raceways
	UL 60950-1	Information Technology Equipment Safety — Part 1: General Requirements
	UL 60950-21	Information Technology Equipment Safety — Part 21: Remote Power Feeding
	UL 60950-22	Information Technology Equipment Safety — Part 22: Equipment to be Installed Outdoors

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	UL 60950-23	Information Technology Equipment Safety — Part 23: Large Data Storage Equipment
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
	UL 10C	Positive Pressure Fire Tests of Door Assemblies
	UL 62	Flexible Cords and Cables
	UL 67	Panelboards
	UL 98	Enclosed and Dead-Front Switches
	UL 305	Panic Hardware
	UL 347	Medium-Voltage AC Contactors, Controllers, and Control Centers
	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
	UL 508	Industrial Control Equipment
	UL 508A	Industrial Control Panels
	UL 845	Motor Control Centers
	UL 869A	Reference Standard for Service Equipment
646	UL 891	Switchboards
	~~UL 891A~~	~~Switchboards Rated 601–1000 V~~
	UL 924	Emergency Lighting and Power Equipment
	UL 977	Fused Power-Circuit Devices
	UL 1008	Transfer Switch Equipment
	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
	UL 1008M	Meter-Mounted Transfer Switches
	UL 1008S	Solid-State Transfer Switches
	UL 1062	Unit Substations
	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	UL 1429	Pullout Switches
	UL 1449	Surge Protective Devices
	UL 1655	Community-Antenna Television Cables
	UL 1989	Standby Batteries
	UL ~~Subject~~ 2755	Modular Data Centers
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
647	UL 1598	Luminaires
	UL 1310	Class 2 Power Units
650	UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
670	ANSI/CSA-C22.2 No. 19085-1	Woodworking machines — Safety — Part 1: Common requirements
	UL 508	Industrial Control Equipment

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	UL 61800-5-1	Adjustable Speed Electrical Power Drive Systems — Part 5-1: Safety Requirements — Electrical, Thermal and Energy
	~~UL 489~~	~~Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures~~
	~~UL 489G~~	~~Outline for Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures, 650–1000 Volts AC and 650–1500 Volts DC~~
	UL 493	Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables
	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
	UL 489G	~~Outline for~~ Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures, 650–1000 Volts AC and 650–1500 Volts DC
675		Reference Standard for Electrical Wires, Cables, and
	UL 1581	Flexible Cords
	UL 6	Electrical Rigid Metal Conduit — Steel
	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	UL 20	General Use Snap-Switches
	UL 62	Flexible Cords and Cables
	UL 360	Liquid-Tight Flexible Metal Conduit
	UL 379	Power Units for Fountain, Swimming Pool, and Spa Luminaires
	UL 467	Grounding and Bonding Equipment
	UL 486D	Sealed Wire Connector Systems
	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	UL 676	Underwater Luminaires and Submersible Junction Boxes
	UL 676A	Potting Compounds for Swimming Pool, Fountain, and Spa Equipment
680	UL 943	Ground-Fault Circuit-Interrupters
	UL 943C	~~Outline for~~ Special Purpose Ground-Fault Circuit-Interrupters
	UL 1004-10	Pool Pump Motors
	~~UL 1060~~	~~Circuit Breaker and Ground Fault Circuit Interrupters~~
	UL 1081	Swimming Pool Pumps, Filters, and Chlorinators
	UL 1241	~~Isolated Power Systems Equipment~~ Junction Boxes for Swimming Pool Luminaires
	UL 1242	Electrical Intermediate Metal Conduit - Steel
	UL 1261	Electric Water Heaters for Pools and Tubs
	UL 1563	Electric Spas, Equipment Assemblies, and Associated Equipment
	UL 1569	Metal-Clad Cables
	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	UL 1795	Hydromassage Bathtubs
	UL 2420	Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
	UL ~~Subject~~ 2452	~~Outline of Investigation for~~ Electric Swimming Pool and Spa Cover Operators

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	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
	UL 2515A	Supplemental Requirements for Extra Heavy Wall Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
	UL 2995	Lifts for Swimming Pools and Spas
	UL 60335-2-1000	Household and Similar Electrical Appliances: Particular Requirements for Electrically Powered Pool Lifts
682	UL 486D	Sealed Wire Connector Systems
	UL 1650	Portable Power Cable
	UL 1838	Low Voltage Landscape Lighting Systems
690	UL 98B	Enclosed and Dead-Front Switches for Use in Photovoltaic Systems
	UL 248-19	Low-Voltage Fuses — Part 19: Photovoltaic Fuses
	UL 467	Grounding and Bonding Equipment
	UL 489B	Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures Ffor Use Wwith Photovoltaic (PV) Systems
	UL ~~Subject~~ 508I	~~Manual~~ Disconnect Switches Intended for Use in Photovoltaic Systems
	UL 1569	Metal-Clad Cables
	UL 1699B	Photovoltaic (PV) DC Arc-Fault Circuit Protection
	UL 1703	Flat-Plate Photovoltaic Modules and Panels
	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources
	UL 2703	Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels
	UL 3001	Distributed Energy Generation and Storage Systems
	UL 3003	Distributed Generation Cables
	UL 3005	Distributed Energy Resource Management Systems
	UL ~~Subject~~ 3703	Solar Trackers
	UL ~~Subject~~ 3730	Photovoltaic Junction Boxes
	UL 3741	Photovoltaic Hazard Control
	UL 4703	Photovoltaic Wire
	UL 6703	Connectors for Use in Photovoltaic Systems
	~~UL Subject 6703A~~	~~Multi-Pole Connectors for Use in Photovoltaic Systems~~
	UL 7103	~~Outline for~~ Investigation for Building-Integrated Photovoltaic Roof Coverings
	UL ~~Subject~~ 8703	Concentrator Photovoltaic Modules and Assemblies
	UL 8801	~~Outline for~~ Photovoltaic ~~Powered~~ Luminaire Systems
	UL ~~Subject~~ 9703	Distributed Generation Wiring Harnesses
	UL 61730-1	Photovoltaic (PV) Module Safety Qualification — Part 1: Requirements for Construction
	UL 61730-2	Photovoltaic (PV) Module Safety Qualification — Part 2: Requirements for Testing
	UL 62109-1	Power Converters for Use in Photovoltaic Power Systems — Part 1: General Requirements
	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation

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692	UL 2262	~~Outline for~~ Fuel Cell Modules for Use in Portable and Stationary Equipment
	UL 2262A	~~Outline for~~ Borohydride Fuel Cartridges with Integral Fuel Processing for Use with Portable Fuel Cell Power Systems or Similar Equipment
	UL 2265	Fuel Cell Power Units and Fuel Storage Containers for Portable Devices
	UL 2265A	~~Outline for~~ Hand-held or Hand-Transportable Fuel Cell Power Units with Disposable Methanol Fuel Cartridges for use in Original Equipment Manufacturer's Information Technology Equipment
	UL 2265C	~~Outline for~~ Hand-Held or Hand-Transportable Alkaline (Direct Borohydride) Fuel Cell Power Units and Borohydride Fuel Cartridges For Use With Consumer Electronics or Information Technology Equipment
	UL 2266	Electromagnetic Compatibility, Electrical Safety, and Physical Protection of Stationary and Portable Fuel Cell Power Systems for Use with Commercial Network Telecommunications Equipment
	UL 2267	Fuel Cell Power Systems for Installation in Industrial Electric Trucks
694	UL 467	Grounding and Bonding Equipment
	UL ~~Subject~~ 489C	Molded-Case Circuit Breakers and Molded-Case Switches for Use with Wind Turbines
	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources
	UL 2227	~~Outline for~~ Flexible Motor Supply Cable and Wind Turbine Tray Cable
		~~Outline for~~ Single Pole Separable Interconnecting Cable
	UL 2736	Connectors for Use with Wind Turbine Generating Systems
	UL 4143	Wind Turbine Generator - Life Time Extension (LTE)
	UL 6141	Wind Turbines Permitting Entry of Personnel
	UL 6142	Wind Turbine Generating Systems — Small
	~~UL 6171~~	~~Wind Turbine Converters and Interconnection Systems Equipment~~
695	UL 6	Electrical Rigid Metal Conduit — Steel
	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	UL 218	Fire Pump Controllers
	UL 448	Centrifugal Stationary Pumps for Fire-Protection Service
	UL 448B	Residential Fire Pumps Intended for One- and Two-Family Dwellings and Manufactured Homes
		Stationary, Rotary-Type, Positive-Displacement Pumps for
	UL 448C	Fire Protection Service
	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	UL 1004-5	Fire Pump Motors
	UL 1242	Electrical Intermediate Metal Conduit — Steel
	UL 1569	Metal-Clad Cables
	UL 1724	~~Outline for~~ Fire Tests for Electrical Circuit Protective Systems
	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables

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	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
700	UL 924	Emergency Lighting and Power Equipment
	UL 1008	Transfer Switch Equipment
	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
	~~UL 1449~~	~~Surge Protective Devices~~
	UL 1724	~~Outline for~~ Fire Tests for Electrical Circuit Protective Systems
	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
	UL 2200	Stationary Engine Generator Assemblies
701	UL 924	Emergency Lighting and Power Equipment
	~~UL 1008~~	~~Transfer Switch Equipment~~
	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
702	UL 98	Enclosed and Dead-Front Switches
	UL 1008	Transfer Switch Equipment
	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
	UL 1008M	Meter-Mounted Transfer Switches
	UL 1008S	Solid-State Transfer Switches
705	UL 62	Flexible Cords and Cables
	UL 98	Enclosed and Dead-Front Switches
	UL 486D	Sealed Wire Connector Systems
	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	UL 1429	Pullout Switches
	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources
	UL 2200	Stationary Engine Generator Assemblies
	UL 3003	~~Outline for~~ Distributed Generation Cables
	UL 6142	Small Wind Turbine Systems
	~~UL 6171~~	~~Wind Turbine Converters and Interconnection Systems Equipment~~
	UL 9540	Energy Storage Systems and Equipment
	UL 62109-2	Power Converters for Use in Photovoltaic Power Systems — Part 2: Particular Requirements for Inverters
	UL 6141	Wind Turbines Permitting Entry of Personnel
706	UL 248-2	Low-Voltage Fuses — Part 2: Class C Fuses
	UL 248-3	Low-Voltage Fuses — Part 3: Class CA and CB Fuses
	UL 248-4	Low-Voltage Fuses — Part 4: Class CC Fuses
	UL 248-5	Low-Voltage Fuses — Part 5: Class G Fuses

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	UL 248-6	Low-Voltage Fuses — Part 6: Class H Non-Renewable Fuses
	UL 248-8	Low-Voltage Fuses — Part 8: Class J Fuses
	UL 248-9	Low-Voltage Fuses — Part 9: Class K Fuses
	UL 248-10	Low-Voltage Fuses — Part 10: Class L Fuses
	UL 248-12	Low-Voltage Fuses — Part 12: Class R Fuses
	UL 248-15	Low-Voltage Fuses — Part 15: Class T Fuses
	UL 248-17	Low-Voltage Fuses - Part 17: Class CF Fuses
	UL 248-18	Low-Voltage Fuses - Part 18: Class CD Fuses
	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
	UL 489H	~~Outline for~~ Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures, for Use with Direct Current (DC) Microgrids
	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources
	UL 9540	Energy Storage Systems and Equipment
708	UL 1	Flexible Metal Conduit
	UL 4	Armored Cable
	UL 83	Thermoplastic-Insulated Wires and Cables
	UL 360	Liquid-Tight Flexible Metal Conduit
	UL 493	Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables
	UL 497A	Secondary Protectors for Communications Circuits
	UL 1008	Transfer Switch Equipment
	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
	UL 1008M	Meter-Mounted Transfer Switches
	UL 1008S	Solid-State Transfer Switches
	UL 1569	Metal-Clad Cables
	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
710	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources
	UL 2200	Stationary Engine Generator Assemblies
	UL 8801	Photovoltaic Luminaire Systems
	UL 9540	Energy Storage Systems and Equipment
	UL 62109-1	Power Converters for use in Photovoltaic Power Systems - Part 1: General Requirements
	UL 62109-2	Power Converters for Use in Photovoltaic Power Systems — Part 2: Particular Requirements for Inverters
712	UL 248-2	Low-Voltage Fuses — Part 2: Class C Fuses
	UL 248-3	Low-Voltage Fuses — Part 3: Class CA and CB Fuses
	UL 248-4	Low-Voltage Fuses — Part 4: Class CC Fuses

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	UL 248-5	Low-Voltage Fuses — Part 5: Class G Fuses
	UL 248-6	Low-Voltage Fuses — Part 6: Class H Non-Renewable Fuses
	UL 248-8	Low-Voltage Fuses — Part 8: Class J Fuses
	UL 248-9	Low-Voltage Fuses — Part 9: Class K Fuses
	UL 248-10	Low-Voltage Fuses — Part 10: Class L Fuses
	UL 248-12	Low-Voltage Fuses — Part 12: Class R Fuses
	UL 248-15	Low-Voltage Fuses — Part 15: Class T Fuses
	UL 248-17	Low-Voltage Fuses - Part 17: Class CF Fuses
	UL 248-18	Low-Voltage Fuses - Part 18: Class CD Fuses
	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
	UL ~~498G~~ 489H	~~Outline for~~ Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures, for Use with Direct Current (DC) Microgrids
	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	UL 1670	Medium Voltage Circuit Breakers and Metal-Clad Switchgear
	~~UL 1671~~	~~Medium Voltage Metal-Clad Switchgear~~
	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources
	UL 6142	Small Wind Turbine Systems
	~~UL 6171~~	~~Wind Turbine Converters and Interconnection Systems Equipment~~
	UL 9540	Energy Storage Systems and Equipment
	UL 60947-1	Low-Voltage Switchgear and Controlgear — Part 1: General Rules
	UL 60947-4-1	Low-Voltage Switchgear and Controlgear — Part 4-1: Contactors and Motor-Starters — Electromechanical Contactors and Motor-Starters
	UL 62109-2	Power Converters for Use in Photovoltaic Power Systems — Part 2: Particular Requirements for Inverters
	UL 13	Standard for Power-Limited Circuit Cables
	UL 1424	Cables for Power-Limited Fire-Alarm Circuits
	UL 1651	Optical Fiber Cable
	UL 1666	Test for Flame Propagation Height of Electrical and Optical-Fiber Cable Installed Vertically in Shafts
	UL 1685	Standard for Safety for Vertical-Tray Fire-Propagation and Smoke- Release Test for Electrical and Optical-Fiber Cables
	UL 2556	Standard for Wire and Cable Test Methods
	UL 1685	Standard for Safety for Vertical-Tray Fire-Propagation and Smoke- Release Test for Electrical and Optical-Fiber Cables
	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
	UL 1724	Fire Tests for Electrical Circuit Protective Systems
	UL 444	Standard for Safety for Communications Cables
722	UL 2024	Standard for Safety for Communications Cables
725	~~UL 13~~	~~Power-Limited Circuit Cables~~

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	UL 444	Communications Cable
	UL 1012	Power Units Other Than Class 2
	UL 1277	Electrical Power and Control Tray Cables with Optional Optical-Fiber Members
	UL 1310	Class 2 Power Units
	UL 1666	Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts
	UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
	UL 2196	Fire Test for Circuit Integrity of Fire -Resistive Power, Instrumentation, Control and Data Cables
	UL 5085-3	Low Voltage Transformers — Part 3: Class 2 and Class 3 Transformers
	UL Subject 9990	Information and Communication Technology (ICT) Power Cables
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
	UL 61010-2-201	Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 2-201: Particular Requirements for Control Equipment
	UL 61800-5-1	Adjustable Speed Electrical Power Drive Systems - Part 5-1: Safety Requirements - Electrical, Thermal and Energy
	UL 1400-1	Fault-Managed Power Systems -Part 1 General Requirements
	UL 1400-2	Fault-Managed Power Systems -Part 2 Requirements for Cables
	UL 1666	Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts
	UL 1685	Vertical-Tray Fire- Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
726	UL 2556	Wire and Cable Test Methods
727	UL 2250	Instrumentation Tray Cable
728	UL 5	Surface Metal Raceways and Fittings
	UL 5A	Nonmetallic Surface Raceways and Fittings
	UL 5B	Strut-Type Channel Raceways and Fittings
	UL 5C	Surface Raceways and Fittings for Use with Data, Signal, and Control Circuits
	UL 209	Cellular Metal Floor Raceways and Fittings
	UL 467	Grounding and Bonding Equipment
	UL 514A	Metallic Outlet Boxes
	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	UL 568	Nonmetallic Cable Tray Systems
	UL 884	Underfloor Raceways and Fittings
	UL Subject 1724	Fire Tests for Electrical Circuit Protective Systems
	UL 2024	Cable Routing Assemblies and Communications Raceways
	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
760	UL 268	Smoke Detectors for Fire Alarm Signaling Systems
	UL 268A	Smoke Detectors for Duct Application

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	UL 486C	Splicing Wire Connectors
	UL 497B	Protectors for Data Communication and Fire Alarm Circuits
	UL 1424	Cables for Power-Limited Fire-Alarm Circuits
	UL 1425	Cables for Non–Power-Limited Fire-Alarm Circuits
	UL 1480	Speakers for Fire Alarm and Signaling Systems, Including Accessories
	UL 1666	Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts
	UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
	UL 60730-2-14	Automatic Electrical Controls; Part 2: Particular Requirements for Electric Actuators
770	UL 467	Grounding and Bonding Equipment
	UL 568	Nonmetallic Cable Tray Systems
	UL 1651	Optical Fiber Cable
	UL 2024	Optical Fiber and Communication Cable Raceway
	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
800	UL 444	Communications Cables
	UL 467	Grounding and Bonding Equipment
	UL 489A	Circuit Breakers for Use in Communication Equipment
	UL 497	Protectors for Paired-Conductor Communications Circuits
	UL 497A	Secondary Protectors for Communications Circuits
	UL 497C	Protectors for Coaxial Communications Circuits
	UL ~~Subject~~ 497E	Protectors for Antenna Lead-In Conductors
	UL ~~Subject~~ 523	Telephone Service Drop Wire
	UL 568	Nonmetallic Cable Tray Systems
	UL 723	Test for Surface Burning Characteristics of Building Materials
	UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords
	UL 1666	Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts
	UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
	UL 1863	Communication Circuit Accessories
	UL 2024	Cable Routing Assemblies and Communications Raceways
	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
805	UL 444	Communications Cables
	UL 497	Protectors for Paired-Conductor Communications Circuits
	UL 497A	Secondary Protectors for Communications Circuits
	UL 497C	Protectors for Coaxial Communications Circuits
	UL ~~Subject~~ 497E	Protectors for Antenna Lead-In Conductors

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	UL ~~Subject~~ 523	Telephone Service Drop Wire
	UL 719	Nonmetallic-Sheathed Cables
	UL 1310	Class 2 Power Units
	UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords
	UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
	UL 1863	Communication Circuit Accessories
	UL 2043	Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces
	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
810	UL 150	Antenna Rotators
	UL 452	Antenna-Discharge Units
	UL 467	Grounding and Bonding Equipment
	UL ~~Subject~~ 497E	Protectors for Antenna Lead-In Conductors
820	UL 444	Communications Cables
	UL ~~Subject~~ 497E	Protectors for Antenna Lead-In Conductors
	UL 1655	Community-Antenna Television Cables
830	UL 444	Communications Cables
	UL 497A	Secondary Protectors for Communications Circuits
	UL 497C	Protectors for Coaxial Communications Circuits
	UL ~~Subject~~ 497E	Protectors for Antenna Lead-In Conductors
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
840	UL 444	Communications Cables
	UL 467	Grounding and Bonding Equipment
	UL 498A	Current Taps and Adapters
	UL 1310	Class 2 Power Units
	UL 1651	Optical Fiber Cable
	UL 1863	Communication Circuit Accessories
	UL 2024	Cable Routing Assemblies and Communications Raceways
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
Tables 11(A) and 11(B)	UL 1310	Class 2 Power Units
	UL 1434	Thermistor-Type Devices
	UL 5085-3	~~Class 2 and Class 3 Transformers~~ Low Voltage Transformers - Part 3: Class 2 and Class 3 Transformers
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements

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Tables 12(A) and 12(B)	UL 1310	Class 2 Power Units
	UL 1434	Thermistor-Type Devices
	UL 5085-3	~~Class 2 and Class 3 Transformers~~ Low Voltage Transformers - Part 3: Class 2 and Class 3 Transformers
	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements

Part 2 – Annex A

Product Safety Standards for Conductors and Equipment that do not have an Associated Listing Requirement

Article	Standard Number	Standard Title
	UL 969	Marking and Labeling Systems
110	UL 9691	Recommended Practice for Nameplates for Use in Electrical Installations
300	UL 635	Insulating Bushings
314	UL 514C	Conduit, Tubing, and Cable Fittings
	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
320	UL 514A	Metallic Outlet Boxes
	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
322	UL 5	Surface Metal Raceways and Fittings
	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
324	UL 5	Surface Metal Raceways and Fittings
330	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
332	UL 1565	Positioning Devices
	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
	UL 1565	Positioning Devices
	UL 514B	Conduit, Tubing, and Cable Fittings
	UL 6	Electrical Rigid Metal Conduit - Steel,
	UL 6A	Electrical Rigid Metal Conduit - Aluminum, Red Brass, and Stainless Steel,
	UL 1242	Electrical Intermediate Metal Conduit - Steel
	UL 651	Schedule 40 and 80 Rigid PVC Conduit
	UL2420	Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
334	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings

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	UL2515A	Supplemental Requirements for Extra Heavy Wall Reinforced Thermosetting Resin Conduit (RTRC) and Fittings.
	UL797	Electrical Metallic Tubing - Steel
	UL797A	Electrical Metallic Tubing - Aluminum and Stainless Steel
	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
337	UL 1565	Positioning Devices
340	UL493	Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables
	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
342	UL 635	Insulating Bushings
	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
344	UL 635	Insulating Bushings
348	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
350	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
352	UL 635	Insulating Bushings
353	UL 635	Insulating Bushings
	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
355	UL 635	Insulating Bushings
356	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
358	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
362	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
368	UL 857	Busways
392	568	Nonmetallic Cable Tray Systems
	UL 62	Flexible Cords and Cables
	UL 498	Attachment Plugs and Receptacles
	UL 498B	Receptacles with Integral Switching Means
400	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts

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	UL 498E	Attachment Plugs, Cord Connectors and Receptacles - Enclosure Types for Environmental Protection
	UL 817	Cord Sets and Power-Supply Cords
	UL 1650	Portable Power Cable
	UL 1680	Stage and Lighting Cables
	UL 514B	Conduit, Tubing, and Cable Fittings
402	UL 66	Fixture Wire
	UL 50	Enclosures for Electrical Equipment, Non-Environmental Considerations
408	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	UL 834	Heating, Water Supply, and Power Boilers - Electric
	UL 1693	Electric Radiant Heating Panels and Heating Panel Sets
	UL 1995	Heating and Cooling Equipment
	UL 1996	Electric Duct Heaters
424	UL 60335-1 and UL 60335-2-40	Safety of Household and Similar Electrical Appliances, Part 1: General Requirements Household and Similar Electrical Appliances, Part 2-40:
425	UL 834	Heating, Water Supply, and Power Boilers - Electric
426	UL1588	Roof and Gutter De-Icing Cable Units
	UL 515	Electrical Resistance Trace Heating for Commercial Applications
	UL 1462	Mobile Home Pipe Heating Cable
	UL 2049	Residential Pipe Heating Cable
427		
430	UL 248-13	Low-Voltage Fuses - Part 13: Semiconductor Fuses
	UL 3001	Distributed Energy Generation and Storage Systems
445	UL 3010	Single Site Energy Systems
	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
	UL 1561	Dry-Type General Purpose and Power Transformers
	UL 5085-2	Low Voltage Transformers - Part 2: General Purpose Transformers
	UL 50	Enclosures for Electrical Equipment, Non-Environmental Considerations
	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	UL 248-1	Low-Voltage Fuses - Part 1: General Requirements
450	UL 248-2	Low-Voltage Fuses - Part 2: Class C Fuses

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	UL 248-3	Low-Voltage Fuses - Part 3: Class CA and CB Fuses
	UL 248-4	Low-Voltage Fuses - Part 4: Class CC Fuses
	UL 248-5	Low-Voltage Fuses - Part 5: Class G Fuses
	UL 248-8	Low-Voltage Fuses - Part 8: Class J Fuses
	UL 248-9	Low-Voltage Fuses - Part 9: Class K Fuses
	UL 810	Capacitors
	UL 60384-14	Fixed Capacitors for Use in Electronic Equipment – Part 14: Sectional Specification: Fixed Capacitors for Electromagnetic Interference Suppression and Connection to the Supply Mains
460	UL 1283	Electromagnetic Interference Filters
	UL 508	Industrial Control Equipment
470	UL 1283	Electromagnetic Interference Filters
	NFPA 497	Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas
	NFPA 499	Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installation in Chemical Process Areas
	NFPA 30	Flammable and Combustible Liquids Code
	NFPA 32	Standard for Drycleaning Facilities
	NFPA 33	Standard for Spray Application Using Flammable or Combustible Materials
	NFPA 34	Standard for Dipping, Coating and Printing Processes Using Flammable or Combustible Liquids
	NFPA 35	Standard for the Manufacture of Organic Coatings
	NFPA 36	Standard for Solvent Extraction Plants
	NFPA 45	Standard on Fire Protection for Laboratories Using Chemicals
	NFPA 55	Compressed Gases and Cryogenic Fluids Code
	NFPA 58	Liquefied Petroleum Gas Code
	NFPA 59	Utility LP-Gas Plant Code
	NFPA 820	Standard for Fire Protection in Wastewater Treatment and Collection Facilities
	API RP 500	Recommended Practice for Classification of Locations of Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 and Division 2
	ISA-12.10	Area Classification in Hazardous (Classified) Dust Locations
	NFPA 77	Recommended Practice on Static Electricity
	NFPA 780	Standard for the Installation of Lightning Protection Systems
	API RP 2003	Protection Against Ignitions Arising Out of Static Lightning and Stray Currents
	API RP 14F	Recommended Practice for Design and Installation of Electrical Systems for Fixed and Floating Offshore Petroleum Facilities for Unclassified and Class I, Division 1 and Division 2 Locations

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	UL RP 121203	Recommended Practice for Portable Electronic Products Suitable for Use in Class I and II, Division 2, Class I Zone 2 and Class III, Division 1 and 2 Hazardous (Classified) Locations
	IEEE 60079-30-2	IEEE/IEC International Standard for Explosive atmospheres — Part 30-2: Electrical resistance trace heating — Application guide for design, installation, and maintenance
	IEEE 844.2	Standard for Skin Effect Trace Heating of Pipelines, Vessels, Equipment, and Structures — Application Guide for Design, Installation, Testing, Commissioning, and Maintenance
	IIAR 2	Standard for Safe Design of Closed-Circuit Ammonia Refrigeration Systems
	ASHRAE 15	Safety Standard for Refrigeration Systems
	ANSI/IEEE C2	National Electrical Safety Code, Section 127A, Coal Handling Areas
	UL 121303	Guide for Combustible Gas Detection as a Method of Protection
	UL 60079-29-2	Explosive Atmospheres — Part 29-2: Gas detectors — Selection, installation, use and maintenance of detectors for flammable gases and oxygen
	UL 120002	Certificate Standard for AEx Equipment for Hazardous (Classified) Locations
	ASME B1.20.1	Pipe Threads, General Purpose (Inch)
	UL 120101	Definitions and Information Pertaining to Electrical Equipment in Hazardous (Classified) Locations
	ISO 965-1	ISO general purpose metric screw threads — Tolerances — Part 1: Principles and basic data
	ISO 965-3	ISO general purpose metric screw threads — Tolerances — Part 3: Deviations for constructional screw threads
	UL 504	Mineral-Insulated, Metal-Sheathed Cable
501	UL 62	Flexible Cord and Cable
502	UL RP 121203	Recommended Practice for Portable/Personal Electronic Products Suitable for Use in Class I, Division 2, Class I, Zone 2, Class II, Division 2, Class III, Division 1, Class III, Division 2, Zone 21 and Zone 22 Hazardous (Classified) Locations
	NFPA 505	Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operations
503	UL RP 121203	Recommended Practice for Portable/Personal Electronic Products Suitable for Use in Class I, Division 2, Class I, Zone 2, Class II, Division 2, Class III, Division 1, Class III, Division 2, Zone 21 and Zone 22 Hazardous (Classified) Locations
504	ISA-RP 12.06.01	Recommended Practice for Wiring Methods for Hazardous (Classified) Locations Instrumentation — Part 1: Intrinsic Safety
	NFPA 497	Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas
505	API RP 505	Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1, and Zone 2

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	ISA-60079-10-1 (12.24.01)	Explosive Atmospheres — Part 10-1: Classification of Areas — Explosive gas atmospheres
	EI 15	Model Code of Safe Practice, Part 15: Area Classification Code for Installations Handling Flammable Fluids
	NFPA 77	Recommended Practice on Static Electricity
	NFPA 780	Standard for the Installation of Lightning Protection Systems
	API RP 2003	Protection Against Ignitions Arising Out of Static Lightning and Stray Currents
	NFPA 30	Flammable and Combustible Liquids Code
	ANSI/API RP 14FZ	Recommended Practice for Design and Installation of Electrical Systems for Fixed and Floating Offshore Petroleum Facilities for Unclassified and Class I, Zone 0, Zone 1, and Zone 2 Locations
	UL 120101	Definitions and Information Pertaining to Electrical Equipment in Hazardous (Classified) Locations
	UL RP 121203	Recommended Practice for Portable/Personal Electronic Products Suitable for Use in Class I, Division 2, Class I, Zone 2, Class II, Division 2, Class III, Division 1, Class III, Division 2, Zone 21 and Zone 22 Hazardous (Classified) Locations
	IEEE 60079-30-2	Explosive Atmospheres — Part 30-2: Electrical resistance trace heating — Application guide for design, installation and maintenance
	IEEE 844.2	Skin Effect Trace Heating of Pipelines, Vessels, Equipment, and Structures — Application Guide for Design, Installation, Testing, Commissioning, and Maintenance
	IIAR 2	Standard for Safe Design of Closed-Circuit Ammonia Refrigeration Systems
	UL 80079-20-1	Explosive Atmospheres - Part 20-1: Material Characteristics for Gas and Vapour Classification - Test Methods and Data
	UL 121303	Guide for Use of Detectors for Flammable Gases
	ISA-60079-29-2	Explosive Atmospheres — Part 29-2: Gas detectors — Selection, installation, use and maintenance of detectors for flammable gases and oxygen
	ASME B1.20.1	Pipe Threads, General Purpose (Inch)
	ISO 965-1	ISO general purpose metric screw threads — Tolerances — Part 1: Principles and basic data
	ISO 965-3	ISO general purpose metric screw threads — Tolerances — Part 3: Deviations for constructional screw threads
	ISA 60079-10-2 (12.10.05)	Explosive Atmospheres — Part 10-2: Classification of Areas — Combustible Dust Atmospheres
	NFPA 499	Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas
	IEEE 60079-30-2	Explosive Atmospheres — Part 30-2: Electrical resistance trace heating — Application guide for design, installation and maintenance
	IEEE 844.2	Skin Effect Trace Heating of Pipelines, Vessels, Equipment, and Structures — Application Guide for Design, Installation, Testing, Commissioning, and Maintenance
	ASME B1.20.1	Pipe Threads, General Purpose (Inch)
506	UL RP 121203	Recommended Practice for Portable/Personal Electronic Products Suitable for Use in Class I, Division 2, Class I, Zone 2, Class II, Division 2, Class III, Division 1, Class III, Division 2, Zone 21 and Zone 22 Hazardous (Classified) Locations

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	NFPA 30A	Code for Motor Fuel Dispensing Facilities and Repair Garages
511	NFPA 88A	Standard for Parking Structures
	NFPA 1	Fire Code
	NFPA 30	Flammable and Combustible Liquids Code
	NFPA 33	Standard for Spray Application Using Flammable or Combustible Materials
	NFPA 36	Standard for Solvent Extraction Plants
	NFPA 55	Liquefied Petroleum Gas Code
	NFPA 70B	Recommended Practice for Electrical Equipment Maintenance
	NFPA 497	Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas
512	ICC IFC	International Fire Code
	NFPA 409	Standard on Aircraft Hangars
	NFPA 30	Flammable and Combustible Liquids Code
513	NFPA 33	Standard for Spray Application Using Flammable or Combustible Materials
	NFPA 30A	Code for Motor Fuel Dispensing Facilities and Repair Garages
	NFPA 58	Liquefied Petroleum Gas Code
	NFPA 59	Utility LP-Gas Plant Code
	NFPA 52	Vehicular Natural Gas Fuel Systems Code
	NFPA 2	Hydrogen Technologies Code
514	NFPA 303	Fire Protection Standard for Marinas and Boatyards
515	NFPA 30	Flammable and Combustible Liquids Code
516	NFPA 33	Standard for Spray Application Using Flammable or Combustible Materials
	NFPA 34	Dipping, Coating, and Printing Processes Using Flammable or Combustible Liquids
	NFPA 91	Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Particulate Solids
	NFPA 701	Standard Methods of Fire Tests for Flame Propagation of Textiles and Films
	NFPA 77	Recommended Practice on Static Electricity
	NFPA 13	Standard for the Installation of Sprinkler Systems
	UL 1063	Machine-Tool Wires and Cables
	UL 44	Thermoset-Insulated Wires and Cables
	UL 66	Fixture Wire
	UL 1569	Metal Clad Cable
620	UL 504	Mineral Insulated Wire

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	UL 4	Armored Cable
	UL 3001	Distributed Energy Generation and Storage Systems
625	UL 3010	Single Site Energy Systems
630	UL 1276	Welding Cable
650	UL 1651	Optical Fiber Cable
	UL 62	Flexible Cords and Cables
660	UL 817	Cord Sets and Power Supply Cords
	UL 62	Flexible Cords and Cables
668	UL 4	Armored Cable
670	UL 2011	Machinery
	UL 44	Thermoset-Insulated Wires and Cables
	UL 83	Thermoplastic-Insulated Wires and Cables
	UL 83A	Fluoropolymer Insulated Wire
	UL 1063	Machine-Tool Wires and Cables
675	UL 1263	Irrigation Cable
	UL 3001	Distributed Energy Generation and Storage Systems
690	UL 3010	Single Site Energy Systems
	UL 3001	Distributed Energy Generation and Storage Systems
691	UL 3010	Single Site Energy Systems
	UL 44	Thermoset-Insulated Wires and Cables
	UL 83	Thermoplastic-Insulated Wires and Cables
	UL 83A	Fluoropolymer Insulated Wire
	UL 1063	Machine-Tool Wires and Cables
	UL 3001	Distributed Energy Generation and Storage Systems
692	UL 3010	Single Site Energy Systems
	UL 44	Thermoset-Insulated Wires and Cables
	UL 83	Thermoplastic-Insulated Wires and Cables
	UL 83A	Fluoropolymer Insulated Wire
	UL 1063	Machine-Tool Wires and Cables
	UL 62	Flexible Cords and Cables
694	UL 3001	Distributed Energy Generation and Storage Systems

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	UL 3010	Single Site Energy Systems
700	UL 3001	Distributed Energy Generation and Storage Systems
701	UL 3001	Distributed Energy Generation and Storage Systems
702	UL 3001	Distributed Energy Generation and Storage Systems
	UL 3001	Distributed Energy Generation and Storage Systems
705	UL 3010	Single Site Energy Systems
710	UL 3001	Distributed Energy Generation and Storage Systems
	UL 3010	Single Site Energy Systems

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Public Comment No. 2165-NFPA 70-2021 [Section No. A.1]

A.1

Article	Standard Number	Standard Title	
110	UL 10C	Positive Pressure Fire Tests of Door Assemblies	
	-	UL 305	Panic Hardware
	-	UL 486D	Sealed Wire Connector Systems
	-	UL 2043	Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces
	-	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
210	UL 935	Fluorescent-Lamp Ballasts	
	-	UL 943	Ground Fault Circuit Interrupters
	-	UL 1029	High-Intensity-Discharge Lamp Ballast
	-	UL 1699	Arc-Fault Circuit-Interrupters
225	UL 6	Electrical Rigid Metal Conduit — Steel	
	-	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	-	UL 360	Liquid-Tight Flexible Metal Conduit
	-	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	-	UL 1242	Electrical Intermediate Metal Conduit — Steel
	-	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	-	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
230	UL 6	Electrical Rigid Metal Conduit — Steel	
	-	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	-	UL 67	Panelboards
	-	UL 98	Enclosed and Dead-Front Switches
	-	UL 218	Fire Pump Controllers
	-	UL 231	Power Outlets
	-	UL 347	Medium-Voltage AC Contactors, Controllers, and Control Centers
	-	UL 360	Liquid-Tight Flexible Metal Conduit
	-	UL 414	Meter Sockets
	-	UL 486A-486B	Wire Connectors
	-	UL 486C	Splicing Wire Connectors
	-	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
	-	UL 508	Industrial Control Equipment
	-	UL 508A	Industrial Control Panels
	-	UL 514B	Conduit, Tubing and Cable Fittings

Article	Standard Number	Standard Title
	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	UL 845	Motor Control Centers
	UL 857	Busways
	UL 869A	Reference Standard for Service Equipment
	UL 891	Switchboards
	UL 891A	Switchboards Rated 601–1000 V
	UL 977	Fused Power-Circuit Devices
	UL 1008	Transfer Switch Equipment
	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
	UL 1008M	Meter-Mounted Transfer Switches
	UL 1008S	Solid-State Transfer Switches
	UL 1053	Ground-Fault Sensing and Relaying Equipment
	UL 1062	Unit Substations
	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	UL 1242	Electrical Intermediate Metal Conduit — Steel
	UL 1429	Pullout Switches
	UL 1449	Surge Protective Devices
	UL 1558	Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear
	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	UL 1740	Robots and Robotic Equipment
	UL 1953	Outline for Power Distribution Blocks
	UL 2011	Outline for Machinery
	UL 2200	Stationary Engine Generator Assemblies
	UL 2416	Audio/Video, Information and Communication Technology Equipment Cabinet, Enclosure and Rack Systems
	UL 2446	Outline for Unitary Boiler Room Systems
	UL 2565	Industrial Metalworking and Woodworking Machine Tools
	UL 2735	Electric Utility Meters
	UL 2745	Outline for Meter Socket Adapters for Communications Equipment
	UL 2876	Outline for Remote Racking Devices for Switchgear and Controlgear
	UL 4248-1	Fuseholders — Part 1: General Requirements
	UL 60947-1	Low-Voltage Switchgear and Controlgear — Part 1: General Rules

Article	Standard Number	Standard Title	
	-	UL 61800-5-1	Adjustable Speed Electrical Power Drive Systems — Part 5-1: Safety Requirements — Electrical, Thermal and Energy
240	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures	
	-	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
250	UL 467	Grounding and Bonding Equipment	
300	UL 44	Thermoset-Insulated Wires and Cables	
	-	UL 83	Thermoplastic-Insulated Wires and Cables
	-	UL 83A	Fluoropolymer Insulated Wire
-	-	-	
	-	UL 263	Fire Tests of Building Construction and Materials
	-	UL 756C	Polymeric Materials — Use in Electrical Equipment Evaluations
	-	UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords
	-	UL 2556	Standard for Wire and Cable Test Methods
	-	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
310	UL 44	Thermoset-Insulated Wires and Cables	
	-	UL 83	Thermoplastic-Insulated Wires and Cables
	-	UL 83A	Fluoropolymer Insulated Wire
-	-	-	
	-	UL 224	Extruded Insulating Tubing
	-	UL 1063	Machine-Tool Wires and Cables
	-	UL 1441	Coated Electrical Sleeving
311	ANSI C119.4	Electric Connectors — Connectors for Use between Aluminum-to-Aluminum and Aluminum-to-Copper Conductors Designed for Normal Operation at or Below 93ºC and Copper-to-Copper Conductors Designed for Normal Operation at or Below 100ºC	
	-	IEEE 48	IEEE Standard for Test Procedures and Requirements for Alternating-Current Cable Terminations Used on Shielded Cables Having Laminated Insulation Rated 2.5kV through 765 kV or Extruded Insulation Rated 2.5 kV through 500 kV
	-	IEEE 386	IEEE Standard for Separable Insulated Connector Systems for Power Distribution Systems Rated 2.5 kV

Article	Standard Number	Standard Title	
			through 35 kV
	-	IEEE 404	IEEE Standard for Extruded and Laminated Dielectric Shielded Cable Joints Rated 2.5 kV to 500 kV
	-	UL 1072	Medium Voltage Power Cables
312	UL 50	Enclosures for Electrical Equipment	
	-	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	-	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
314	UL 50	Enclosures for Electrical Equipment	
	-	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	-	UL 486D	Sealed Wire Connector Systems
	-	UL 498	Attachment Plugs and Receptacles
	-	UL 498B	Outline for Receptacles with Integral Switching Means
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection
	-	UL 514A	Metallic Outlet Boxes
	-	UL 514B	Conduit, Tubing, and Cable Fittings
	-	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	-	UL 514D	Cover Plates for Flush-Mounted Wiring Devices
	-	UL 1953	Power Distribution Blocks
320	UL 4	Armored Cable	
322	NEMA Publication No. UC2	Under-carpet Power Distribution Systems	
324	NEMA Publication No. UC2	Under-carpet Power Distribution Systems	
330	UL 1569	Metal-Clad Cables	
	-	UL 2225	Cables and Cable-Fittings For Use In Hazardous (Classified) Locations
332	UL 504	Outline for Mineral-Insulated, Metal-Sheathed Cable	
334	UL 719	Nonmetallic-Sheathed Cables	
	-	UL Subject 2256	Nonmetallic Sheathed Cable Interconnects
336	UL 1277	Electrical Power and Control Tray Cables with Optional Optical-Fiber Members	
337	UL 1309A	Cable for Use in Mobile Installations	
338	UL 854	Service-Entrance Cables	

Article	Standard Number	Standard Title	
340	UL 493	Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables	
341	-	-	
342	UL 1242	Electrical Intermediate Metal Conduit — Steel	
344	UL 6	Electrical Rigid Metal Conduit — Steel	
	-	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
348	UL 1	Flexible Metal Conduit	
	-	UL 62275	Cable Management Systems -- Cable Ties for Electrical Installation
350	UL 360	Liquid-Tight Flexible Steel Conduit	
	-	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
352	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings	
353	UL 651A	Schedule 40 and 80 High Density Polyethylene (HDPE) Conduit	
354	UL 1990	Nonmetallic Underground Conduit with Conductors	
355	UL 2420	Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings	
	-	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
	-	UL 2515A	Supplemental Requirements for Extra-Heavy Wall Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
356	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit	
	-	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
358	UL 797	Electrical Metallic Tubing — Steel	
	-	UL 797A	Electrical Metallic Tubing — Aluminum
360	UL Subject 1652	Flexible Metallic Tubing	
362	UL 1653	Electrical Nonmetallic Tubing	
	-	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
366	UL 870	Wireways, Auxiliary Gutters, and Associated Fittings	
370	ANSI/CSA C22.2 No. 273	Cablebus	
374	UL 209	Cellular Metal Floor Raceways and Fittings	
	-	UL 360	Liquid-Tight Flexible Metal Conduit
	-	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit

Article	Standard Number	Standard Title	
376	UL 1953	Power Distribution Blocks	
378	UL 870	Wireways, Auxiliary Gutters, and Associated Fittings	
382	UL 5A	Nonmetallic Surface Raceways and Fittings	
	-	UL183	Manufactured Wiring Systems
	-	UL 467	Grounding and Bonding Equipment
	-	UL 498	Attachment Plugs and Receptacles
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection
	-	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	-	UL 498M	Marine Shore Power Inlets
	-	UL 514D	Cover Plates for Flush-Mounted Wiring Devices
	-	UL 746C	Polymeric Materials - Use in Electrical Equipment Evaluations
	-	UL 943	Ground-Fault Circuit-Interrupters
	-	UL 991	Tests for Safety-Related Controls Employing Solid-State Devices
	-	UL 1077	Supplementary Protectors for Use in Electrical Equipment
	-	UL 1699	Arc-Fault Circuit-Interrupters
	-	UL 1998	Software in Programmable Components
384	UL 5B	Strut-Type Channel Raceways and Fittings	
386	UL 5	Surface Metal Raceways and Fittings	
388	UL 5A	Nonmetallic Surface Raceways and Fittings	
392	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation	
393	UL 13	Power-Limited Circuit Cables	
	-	UL 50	Enclosures for Electrical Equipment, Non-Environmental Considerations
	-	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	-	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	-	UL 1310	Class 2 and Class 3 Power Supplies
	-	UL 2043	Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces
	-	UL 2577	Suspended Ceiling Power Grid Systems and Equipment

Article	Standard Number	Standard Title	
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
396	UL 1072	Medium-Voltage Power Cables	
400	UL 62	Flexible Cords and Cables	
	-	UL 498	Attachment Plugs and Receptacles
	-	UL 498B	Outline for Receptacles with Integral Switching Means
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles - Enclosure Types for Environmental Protection
	-	UL 817	Cord Sets and Power-Supply Cords
	-	UL Subject 1650	Portable Power Cable
402	UL 66	Fixture Wire	
404	UL 20	General-Use Snap Switches	
	-	UL 98	Enclosed and Dead-Front Switches
	-	UL Subject 98A	Open-Type Switches
	-	UL 363	Knife Switches
	-	UL 489	Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Timers and Time Switches
	-	UL 773	Plug-In Locking Type Photocontrols for Use with Area Lighting
	-	UL 773A	Nonindustrial Photoelectric Switches for Lighting Control
	-	UL 917	Clock-Operated Switches
	-	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	-	UL 1472	Solid-State Dimming Controls
	-	UL 1429	Pullout Switches
	-	UL 60730-1	Automatic Electrical Controls — Part 1: General Requirements
	-	UL 60730-2	Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Timers and Time Switches
	-	ANSI/NEMA WD 6–2016	Wiring Devices — Dimensional Specifications.
406	UL 498	Attachment Plugs and Receptacles	
	-	UL 498B	Receptacles with Integral Switching Means
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles - Enclosure Types for Environmental Protection

Article	Standard Number	Standard Title	
	-	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	-	UL 498M	Marine Shore Power Inlets
	-	UL 514A	Metallic Outlet Boxes
	-	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	-	UL 514D	Cover Plates for Flush-Mounted Wiring Devices
	-	UL 943	Ground-Fault Circuit-Interrupters
	-	UL 943B	Appliance Leakage-Current Interrupters
	-	UL 943C	Outline for Special Purpose Ground-Fault Circuit-Interrupters
	-	UL 970	Merchandising Displays
	-	UL 1286	Office Furnishings
	-	UL 1310	Class 2 and Class 3 Power Units
	-	UL 1682	Plugs, Receptacles, and Cable Connectors, of the Pin and Sleeve Type
	-	UL 1691	Single Pole Locking-Type Separable Connectors
	-	UL 1699	Arc-Fault Circuit-Interrupters
	-	UL 2999	Individual Commercial Office Furnishings
408	UL 44	Thermoset-Insulated Wires and Cables	
	-	UL 67	Panelboards
	-	UL 891	Switchboards
	-	UL 1558	Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear
	-	UL 60947-1	Low-Voltage Switchgear and Controlgear — Part 1: General Rules
	-	UL 60947-4-1	Low-Voltage Switchgear and Controlgear — Part 4-1: Contactors and Motor-Starters — Electromechanical Contactors and Motor-Starters
	-	UL 60947-4-2	Voltage Switchgear and Controlgear — Part 4-2: Contactors and Motor-Starters — AC Semiconductor Motor Controllers and Starters
	-	UL 60947-5-1	Low-Voltage Switchgear and Controlgear — Part 5-1: Control Circuit Devices and Switching Elements — Electromechanical Control Circuit Devices
	-	UL 60947-5-2	Low-Voltage Switchgear and Controlgear — Part 5-2: Control Circuit Devices and Switching Elements — Proximity Switches
	-	UL 60947-7-1	Low-Voltage Switchgear and Controlgear — Part 7-1: Ancillary Equipment — Terminal Blocks for Copper Conductors

Article	Standard Number	Standard Title	
	-	UL 60947-7-2	Low-Voltage Switchgear and Controlgear — Part 7-2: Ancillary Equipment — Protective Conductor Terminal Blocks for Copper Conductors
	-	UL 60947-7-3	Low-Voltage Switchgear and Controlgear — Part 7-3: Ancillary Equipment — Safety Requirements for Fuse Terminal Blocks
409	UL 508	Industrial Control Equipment	
	-	UL 508A	Industrial Control Panels
410	ANSI/CSA-C22.2 No. 184.2	Solid-State Controls for Lighting Systems (SSCLS)	
	-	UL 153	Portable Electric Luminaires
	-	UL 496	Lampholders
	-	UL 498	Attachment Plugs and Receptacles
	-	UL 498B	Outline for Receptacles with Integral Switching Means
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles - Enclosure Types for Environmental Protection
	-	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	-	UL 542	Fluorescent Lamp Starters
	-	UL 588	Seasonal and Holiday Decorative Products
	-	UL 935	Fluorescent-Lamp Ballasts
	-	UL 943	Ground-Fault Circuit-Interrupters
	-	UL 970	Merchandising Displays
	-	UL 1029	High-Intensity-Discharge Lamp Ballasts
	-	UL Subject 1029A	Ignitors and Related Auxiliaries for HID Lamp Ballasts
	-	UL 1574	Track Lighting Systems
	-	UL 1598	Luminaires
	-	UL 1598B	Luminaire Reflector Kits for Installation on Previously Installed Fluorescent Luminaires, Supplemental Requirements
	-	UL 1598C	Light-Emitting Diode (LED) Retrofit Luminaire Conversion Kits
	-	UL 1993	Self-Ballasted Lamps and Lamp Adapters
	-	UL 2388	Flexible Lighting Products
	-	UL 8750	Light Emitting Diode (LED) Equipment for Use in Lighting Products
	-	UL 8752	Organic Light Emitting Diode (OLED) Panels
	-	UL 8753	Field-Replaceable Light Emitting Diode (LED) Light Engines

Article	Standard Number	Standard Title	
	-	UL 8754	Holders, Bases and Connectors for Solid-State (LED) Light Engines and Arrays
	-	UL Subject 8800	Horticultural Lighting Equipment
411	UL 234	Low-Voltage Lighting Fixtures for Use in Recreational Vehicles	
	-	UL 1310	Class 2 and Class 3 Power Units
	-	UL 1838	Low-Voltage Landscape Lighting Systems
	-	UL 2108	Low-Voltage Lighting Systems
	-	UL 5085-3	Class 2 and Class 3 Transformers
422	ANSI/CSA-C22.2 No. 339	Hand-held motor-operated electric tools — Safety — Particular requirements for chain beam saws	
	-	UL 22	Amusement and Gaming Machines
	-	UL 73	Motor-Operated Appliances
	-	UL 82	Electric Gardening Appliances
	-	UL 122	Photographic Equipment
	-	UL 141	Garment Finishing Appliances
	-	UL 174	Household Electric Storage Tank Water Heaters
	-	UL 197	Commercial Electric Cooking Appliances
	-	UL 283	Air Fresheners and Deodorizers
	-	UL 399	Drinking Water Coolers
	-	UL 430	Waste Disposers
	-	UL 474	Dehumidifiers
	-	UL 498	Attachment Plugs and Receptacles
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles - Enclosure Types for Environmental Protection
	-	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	-	UL 499	Electric Heating Appliances
	-	UL 507	Electric Fans
	-	UL 514A	Metallic Outlet Boxes
	-	UL 515	Electric Resistance Trace Heating for Commercial Applications
	-	UL 561	Floor Finishing Machines
	-	UL 574	Electric Oil Heaters
	-	UL 621	Ice Cream Makers
	-	UL 705	Power Ventilators
	-	UL 710B	Recirculating Systems
	-	UL 749	Household Dishwashers
	-	UL 751	Vending Machines

Article	Standard Number	Standard Title
-	UL 763	Motor-Operated Commercial Food Preparing Machines
-	UL 778	Standard for Motor-Operated Water Pumps
-	UL 834	Heating, Water Supply, and Power Boilers - Electric
-	UL 858	Household Electric Ranges
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-	UL 962	Household and Commercial Furnishings
-	UL 962A	Furniture Power Distribution Units
-	UL 979	Water Treatment Appliances
-	UL 982	Motor-Operated Household Food Preparing Machines
-	UL 987	Stationary and Fixed Electric Tools
-	UL 1017	Vacuum Cleaners, Blower Cleaners, and Household Floor Finishing Machines
-	UL 1026	Household Electric Cooking and Food Serving Appliances
-	UL 1086	Household Trash Compactors
-	UL 1090	Electric Snow Movers
-	UL 1206	Electric Commercial Clothes-Washing Equipment
-	UL 1240	Electric Commercial Clothes-Drying Equipment
-	UL 1278	Movable and Wall- or Ceiling-Hung Electric Room Heaters
-	UL 1447	Electric Lawn Mowers
-	UL 1450	Motor-Operated Air Compressors, Vacuum Pumps, and Painting Equipment
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480	UL 10C	Positive Pressure Fire Tests of Door Assemblies	
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	-	UL 60079-28	Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation.
	-	UL 60079-29-1	Explosive Atmospheres — Part 29-1: Gas Detectors — Performance Requirements of Detectors for Flammable Gases
	-	UL 60079-30-1	Explosive Atmospheres — Electrical Resistance Trace Heating — General and Testing Requirements
	-	UL 121201	Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations
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-	UL 467	Grounding and Bonding Equipment
-	UL 504	Outline for Mineral-Insulated, Metal-Sheathed Cable
-	UL 674	Electric Motors and Generators for Use in Hazardous (Classified) Locations
-	UL 783	Electric Flashlights and Lanterns for Use in Hazardous (Classified) Locations
-	UL 823	Standard for Electric Heaters For Use in Hazardous (Classified) Locations
-	UL 844	Luminaires for Use in Hazardous (Classified) Locations
-	UL 1072	Medium-Voltage Power Cables
-	UL 1203	Explosionproof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations
-	UL 1272	Electrical Power and Control Tray Cables with Optional Optical-Fiber Members
-	UL 1309A	P-Cables
-	UL 1389	Standard for Plant Oil Extraction Equipment for Installation and Use in Ordinary (Unclassified) Locations and Hazardous (Classified) Locations
-	UL 1569	Metal-Clad Cables
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-	UL 2011 (Part 3)	Outline of Investigation for Machinery
-	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
-	UL 2515A	Supplemental Requirements for Extra Heavy Wall Reinforced Thermosetting Resin Conduit (RTRC) and Fittings

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	-	UL 60079-28	Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation
	-	UL 60079-30-1	Explosive Atmospheres — Electrical Resistance Trace Heating — General and Testing Requirements
	-	UL 121201	Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations
	-	UL 121303	Guide for Combustible Gas Detection as a Method of Protection
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	-	UL 783	Electric Flashlights and Lanterns for Use in Hazardous (Classified) Locations
	-	UL 823	Standard for Electric Heaters For Use in Hazardous (Classified) Locations
	-	UL 844	Luminaires for Use in Hazardous (Classified) Locations
	-	UL 1203	Explosionproof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations
	-	UL 1309	Marine Shipboard Cable
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	-	UL 2011 (Part 3)	Outline of Investigation for Machinery
	-	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
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	-	UL 60079-28	Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation.

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	-	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
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	-	UL 121201	Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations
504	UL 698A	Standard for Industrial Control Panels Relating to Hazardous (Classified) Locations	
	-	UL 913	Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous (Classified) Locations
	-	UL 120202	Recommendations for the Preparation, Content, and Organization of Intrinsic Safety Control Drawings
505	IEEE 844.1	Skin Effect Trace Heating of Pipelines, Vessels, Equipment, and Structures — General, Testing, Marking, and Documentation Requirements	
-	-	-	
	-	UL 13	Power Limited Circuit Cables
	-	UL 674	Electric Motors and Generators for Use in Hazardous (Classified) Locations
	-	UL 1203	Explosionproof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations
	-	UL 1309	Marine Shipboard Cable
	-	UL 1389	Standard for Plant Oil Extraction Equipment for Installation and Use in Ordinary (Unclassified) Locations and Hazardous (Classified) Locations

Article	Standard Number	Standard Title	
-		UL 2011 (Part 3)	Outline of Investigation for Machinery
-		UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
-		UL 2250	Instrumentation Tray Cable
-		UL 2874	Outline for Electric Motors for Use in Hazardous (Classified) Locations — Protection by Pressurized Atmosphere Maintained above the UFL
-		UL 60079-0	Explosive Gas Atmospheres — Part 0: Equipment — General Requirements
-		UL 60079-1	Explosive Gas Atmospheres — Part 1: Type of Protection — Flameproof “d”
-		UL 60079-2	Standard for Explosive Atmospheres — Part 2: Equipment protection by pressurized enclosure “p”
-		UL 60079-5	Explosive Gas Atmospheres — Part 5: Type of Protection — Powder Filling “q”
-		UL 60079-6	Standard for Explosive Atmospheres — Part 6: Equipment Protection by Liquid Immersion “o”
-		UL 60079-7	Explosive Gas Atmospheres — Part 7: Increased Safety “e”
-		UL 60079-10-1	Part 10-1: Classification of Areas — Explosive Gas Atmospheres
-		UL 60079-11	Explosive Atmospheres — Part 11: Equipment Protection by Intrinsic Safety “i”
-		UL 60079-13	Standard for Explosive Atmospheres — Part 13: Equipment Protection by Pressurized Room “p” and Artificially Ventilated Room “v”
-		UL 60079-15	Electrical Apparatus for Explosive Gas Atmospheres — Part 15: Type of Protection “n”
-		UL 60079-18	Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection — Encapsulation “m”
-		UL 60079-25	Explosive Atmospheres — Part 25: Intrinsically Safe Electrical Systems
-		UL 60079-26	Standard for Explosive Atmospheres — Part 26: Equipment with Equipment Protection Level (EPL) Ga
-		UL 60079-28	Standard for Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation
-		UL 60079-29-1	Explosive Atmospheres — Part 29-1: Gas Detectors — Performance Requirements of Detectors for Flammable Gases

Article	Standard Number	Standard Title	
	-	UL 60079-29-4	Explosive Atmospheres — Part 29-4: Gas Detectors — Performance Requirements of Open Path Detectors for Flammable Gases
	-	UL 60079-30-1	Standard for Explosive Atmospheres — Part 30-1: Electrical Resistance Trace Heating - General and Testing Requirements
	-	UL 122001	General Requirements for Electrical Ignition Systems for Internal Combustion Engines in Class I, Division 2 or Zone 2, Hazardous (Classified) Locations
	-	UL 122701	Requirements for Process Sealing Between Electrical Systems and Flammable or Combustible Process Fluids
506	IEEE 844.1	Skin Effect Trace Heating of Pipelines, Vessels, Equipment, and Structures — General, Testing, Marking, and Documentation Requirements	
-	-	-	
	-	UL 13	Power Limited Circuit Cables
	-	UL 1277	Electrical Power and Control Tray Cables with Optional Optical-Fiber Members
	-	UL 2011 (Part 3)	Outline of Investigation for Machinery
	-	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
	-	UL 60079-0	Explosive Gas Atmospheres — Part 0: Equipment — General Requirements
	-	UL 60079-2	Standard for Explosive atmospheres — Part 2: Equipment protection by pressurized enclosure 'p'
	-	UL 60079-10-2	Part 10-2: Classification of Areas — Combustible Dust Atmospheres
	-	UL 60079-11	Explosive Atmospheres — Part 11: Equipment Protection by Intrinsic Safety "i"
	-	UL 60079-18	Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection — Encapsulation “m”
	-	UL 60079-28	Standard for Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation
	-	UL 60079-30-1	Explosive Atmospheres — Electrical Resistance Trace Heating — General and Testing Requirements
	-	UL 60079-31	Explosive Atmospheres — Part 31: Equipment Dust Ignition Protection by Enclosure “t”

Article	Standard Number	Standard Title	
	-	UL 62784	Vacuum Cleaners and Dust Extractors Providing Equipment Protection Level Dc for the Collection of Combustible Dusts — Particular Requirements
511	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations	
	-	UL 122701	Requirements for Process Sealing Between Electrical Systems and Flammable or Combustible Process Fluids
514	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations	
515	UL 844	Luminaires for Use in Hazardous (Classified) Locations	
516	-	-	
517	AAMI ES60601-1	Medical electrical equipment— Part 1: General requirements for basic safety and essential performance	
	-	ES-60601-1	AAMI Medical Electrical Equipment — Part 1: General Requirements for Basic Safety and Essential Performance
	-	UL 5	Surface Metal Raceways and Fittings
	-	UL 5A	Nonmetallic Surface Raceways and Fittings
	-	UL 467	Grounding and Bonding Equipment
	-	UL 498	Attachment Plugs and Receptacles
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection
	-	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	-	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	-	UL 1022	Line Isolation Monitors
	-	UL 1047	Isolated Power Systems Equipment
	-	UL 2930	Cord-and-Plug-connected Health Care Facility Outlet Assemblies
	-	UL 60601-1	Medical Electrical Equipment — Part 1: General Requirements for Safety
	-	UL 122701	Requirements for Process Sealing Between Electrical Systems and Flammable or Combustible Process Fluids
518	UL 498	Attachment Plugs and Receptacles	
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection

Article	Standard Number	Standard Title	
	-	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	-	UL 943	Ground-Fault Circuit-Interrupters
	-	UL 943C	Outline for Special Purpose Ground-Fault Circuit-Interrupters
520	UL 62	Flexible Cords and Cables	
	-	UL Subject 334	Theater Lighting Distribution and Control Equipment
	-	UL 1573	Stage and Studio Luminaires and Connector Strips
	-	UL 1640	Portable Power-Distribution Equipment
	-	UL 1691	Single Pole Locking-Type Separable Connectors
522	UL 13	Power Limited Circuit Cables	
	-	UL 1063	Machine-Tool Wires and Cables
	-	UL 2250	Instrumentation Tray Cable
525	UL 62	Flexible Cords and Cables	
	-	UL 817	Cord Sets and Power-Supply Cords
	-	UL 943	Ground-Fault Circuit-Interrupters
	-	UL 943C	Outline for Special Purpose Ground-Fault Circuit-Interrupters
	-	UL 1691	Single Pole Locking-Type Separable Connectors
530	UL 62	Flexible Cords and Cables	
	-	UL 1479	Fire Tests of Penetration Firestops
	-	UL 1573	Stage and Studio Luminaires and Connector Strips
	-	UL 1680	Outline for Stage and Lighting Cables
	-	UL 1691	Single Pole Locking-Type Separable Connectors
	-	UL 1836	Outline of Investigation for Electric Motors and Generators for Use in Class I, Division 2, Class I, Zone 2, Class II, Division 2 and Zone 22 Hazardous (Classified) Locations
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment - Part 1: Safety Requirements
540	UL 62368-1	Audio/Video, Information and Communication Technology Equipment - Part 1: Safety Requirements	
545	UL 5	Surface Metal Raceways and Fittings	
	-	UL 5A	Nonmetallic Surface Raceways and Fittings
	-	UL 5B	Strut-Type Channel Raceways and Fittings
	-	UL 5C	Surface Raceways and Fittings for Use with Data, Signal, and Control Circuits
	-	UL 20	General Use Snap Switches

Article	Standard Number	Standard Title	
	-	UL 209	Cellular Metal Floor Raceways and Fittings
	-	UL 498	Plugs and Receptacles
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection
	-	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	-	UL 514A	Metallic Outlet Boxes
	-	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	-	UL 2024	Cable Routing Assemblies and Communications Raceways
547	UL 50	Enclosures for Electrical Equipment, Non-Environmental Considerations	
	-	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	-	UL 62	Flexible Cords and Cables
	-	UL 514A	Metallic Outlet Boxes
	-	UL 514B	Conduit, Tubing, and Cable Fittings
	-	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	-	UL 1598	Luminaires
	-	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
550	UL 6	Electrical Rigid Metal Conduit - Steel	
	-	UL 6A	Electrical Rigid Metal Conduit - Aluminum, Red Brass and Stainless Steel
	-	UL 83	Thermoplastic-Insulated Wires and Cables
	-	UL 234	Low Voltage Lighting Fixtures for Use in Recreational Vehicles
	-	UL 307A	Liquid Fuel-Burning Heating Appliances for Manufactured Homes and Recreational Vehicles
	-	UL 307B	Gas-Burning Heating Appliances for Manufactured Homes and Recreational Vehicles
	-	UL 360	Liquid-Tight Flexible Metal Conduit
	-	UL 467	Grounding and Bonding Equipment
	-	UL 498	Plugs and Receptacles
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts

Article	Standard Number	Standard Title	
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles - Enclosure Types for Environmental Protection
	-	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	-	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	-	UL 817	Cord Sets and Power-Supply Cords
	-	UL 1242	Electrical Intermediate Metal Conduit — Steel
	-	UL Subject 1462	Mobile Home Pipe Heating Cable
	-	UL 1598	Luminaires
	-	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	-	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
551	UL 6	Electrical Rigid Metal Conduit — Steel	
	-	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	-	UL 62	Flexible Cords and Cables
	-	UL 231	Power Outlets
	-	UL 360	Liquid-Tight Flexible Metal Conduit
	-	UL 467	Grounding and Bonding Equipment
	-	UL 486C	Splicing Wire Connectors
	-	UL 498	Attachment Plugs and Receptacles
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection
	-	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	-	UL 514A	Metallic Outlet Boxes
	-	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	-	UL 514D	Cover Plates for Flush-Mounted Wiring Devices
	-	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	-	UL 817	Cord Sets and Power-Supply Cords
	-	UL 943	Ground-Fault Circuit-Interrupters
	-	UL 1004-4	Electric Generators
	-	UL 1008	Transfer Switch Equipment
	-	UL 1008M	Outline for Transfer Switch Equipment, Meter Mounted
	-	UL 1008S	Solid-State Transfer Switches
	-	UL 1242	Electrical Intermediate Metal Conduit — Steel

Article	Standard Number	Standard Title	
	-	UL 1449	Surge Protective Devices
	-	UL 1598	Luminaires
	-	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	-	UL 2200	Stationary Engine Generator Assemblies
	-	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
552	SAE J1128-2015	Low Voltage Primary Cable, for Types GXL, HDT, and SXL	
	-	SAE J1127-2015	Low Voltage Battery Cable, for Types SGT and SGR
	-	UL 6	Electrical Rigid Metal Conduit — Steel
	-	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	-	UL 50	Enclosures for Electrical Equipment, Non-Environmental Considerations
	-	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	-	UL 62	Flexible Cords and Cables
	-	UL 67	Panelboards
	-	UL 231	Power Outlets
	-	UL 234	Low Voltage Lighting Fixtures for Use in Recreational Vehicles
	-	UL 360	Liquid-Tight Flexible Metal Conduit
	-	UL 430	Waste Disposers
	-	UL 467	Grounding and Bonding Equipment
	-	UL 514A	Metallic Outlet Boxes
	-	UL 514B	Conduit, Tubing, and Cable Fittings
	-	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	-	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	-	UL 817	Cord Sets and Power-Supply Cords
	-	UL 916	Energy Management Equipment
	-	UL 943	Ground-Fault Circuit-Interrupters
	-	UL 1004-4	Electric Generators
	-	UL 1242	Electrical Intermediate Metal Conduit — Steel
	-	UL 1563	Electric Spas, Equipment Assemblies, and Associated Equipment
	-	UL 1598	Luminaires
	-	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	-	UL 2200	Stationary Engine Generator Assemblies
	-	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings

Article	Standard Number	Standard Title
555	UL 6	Electrical Rigid Metal Conduit — Steel
	-	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	-	UL 231	Power Outlets
	-	UL 486D	Sealed Wire Connector Systems
	-	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	-	UL 1650	Portable Power Cable
	-	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
590	UL 496	Lampholders
	-	UL 514B	Conduit, Tubing, and Cable Fittings
	-	UL 588	Seasonal and Holiday Decorative Products
	-	UL 817	Cord Sets
	-	UL 943	Ground-Fault Circuit-Interrupters
	-	UL 1377	Outline for Wire used in Low Voltage Seasonal Lighting Products In Circuits With a Maximum Available Power of 15W
	-	UL 1838	Low Voltage Landscape Lighting Systems
	-	UL 2108	Low Voltage Lighting Systems
600	UL 1	Flexible Metal Conduit
	-	UL 5	Surface Metal Raceways and Fittings
	-	UL 5A	Nonmetallic Surface Raceways and Fittings
	-	UL 13	Power-Limited Circuit Cables
	-	UL 48	Electric Signs
	-	UL 50	Enclosures for Electrical Equipment, Non-Environmental Considerations
	-	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	-	UL 98B	Outline for Enclosed and Dead-Front Switches for Use in Photovoltaic Systems
	-	UL 248-19	Low-Voltage Fuses — Part 19: Photovoltaic Fuses
	-	UL 360	Liquid-Tight Flexible Metal Conduit
	-	UL 489B	Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures For Use With Photovoltaic (PV) Systems
	-	UL 508I	Outline for Disconnect Switches Intended for Use in Photovoltaic Systems
	-	UL 814	Gas-Tube-Sign Cable
	-	UL 879	Electric Sign Components
	-	UL 879A	LED Sign and Sign Retrofit Kits

Article	Standard Number	Standard Title	
	-	UL Subject 879B	Polymeric Enclosure Systems for the Splice Between Neon Tubing Electrode Leads and GTO Cable, and the GTO Cable Leading to the Splice
	-	UL 943	Ground-Fault Circuit-Interrupters
	-	UL 1310	Class 2 and Class 3 Power Units
	-	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	-	UL 1699B	Photovoltaic (PV) DC Arc-Fault Circuit Protection
	-	Ul 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources
	-	UL 2161	Neon Transformers and Power Supplies
	-	UL 2703	Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels
	-	UL 3001	Distributed Energy Generation and Storage Systems
	-	UL 3003	Outline for Distributed Generation Cables
	-	UL 3703	Solar Trackers
	-	UL 4248-18	Outline for Fuseholders — Part 18: Photovoltaic
	-	UL 4703	Photovoltaic Wire
	-	UL 6703	Connectors for Use in Photovoltaic Systems
	-	UL 7103	Outline for Investigation for Building-Integrated Photovoltaic Roof Coverings
	-	UL 8703	Outline for Concentrator Photovoltaic Modules and Assemblies
	-	UL 8801	Outline for Photovoltaic-Powered Luminaire Systems
	-	UL 9703	Outline for Distributed Generation Wiring Harnesses
	-	UL 61730-1	Photovoltaic (PV) Module Safety Qualification — Part 1: Requirements For Construction
	-	UL 61730-2	Photovoltaic (PV) Module Safety Qualification — Part 2: Requirements For Testing
	-	UL 62109	Power Converters for Use in Photovoltaic Power Systems — Part 1: General Requirements
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
604	UL 1	Flexible Metal Conduit	
	-	UL 4	Armored Cable
	-	UL 5	Surface Metal Raceways and Fittings

Article	Standard Number	Standard Title	
	-	UL 5A	Nonmetallic Surface Raceways and Fittings
	-	UL 5B	Strut-Type Channel Raceways and Fittings
	-	UL 5C	Surface Raceways and Fittings for Use with Data, Signal, and Control Circuits
	-	UL 62	Flexible Cords and Cables
	-	UL 183	Manufactured Wiring Systems
	-	UL 209	Cellular Metal Floor Raceways and Fittings
	-	UL 360	Liquid-Tight Flexible Metal Conduit
	-	UL 857	Busways
	-	UL 1569	Metal-Clad Cables
	-	UL 2024	Cable Routing Assemblies and Communications Raceways
605	UL 962	Household and Commercial Furnishings	
	-	UL 1286	Office Furnishings
	-	UL 1310	Class 2 and Class 3 Power Units
	-	UL 2999	Individual Commercial Office Furnishings
	-	UL 5085	Class 2 and Class 3 Transformers
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment - Part 1: Safety Requirements
610	UL 62	Flexible Cords and Cables	
	-	UL Subject 2273	Festoon Cable
620	UL 62	Flexible Cords and Cables	
	-	UL 83	Thermoplastic-Insulated Wires and Cables
	-	UL 104	Elevator Door Locking Devices and Contacts
	-	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
	-	UL 508	Industrial Control Equipment
	-	UL 508A	Industrial Control Panels
	-	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	-	UL 1310	Class 2 Power Units
	-	UL 1449	Surge Protective Devices
	-	UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
	-	UL 2556	Wire and Cable Test Methods
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
625	UL 2202	Electric Vehicle (EV) Charging System Equipment	

Article	Standard Number	Standard Title	
	-	UL 2231-1	Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits — Part 1: General Requirements
	-	UL 2231-2	Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits — Part 2: Particular Requirements for Protection Devices for Use in Charging Systems
	-	UL 2251	Plugs, Receptacles and Couplers for Electrical Vehicles
	-	UL 2580	Batteries for Use in Electric Vehicles
	-	UL 2594	Electric Vehicle Supply Equipment
	-	UL Subject 9741	Bidirectional Electric Vehicle (EV) Charging System Equipment
626	UL 62	Flexible Cords and Cables	
	-	UL 231	Power Outlets
	-	UL 498	Attachment Plugs and Receptacles
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection
	-	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	-	UL 817	Cord Sets and Power-Supply Cords
	-	UL 1686	Pin and Sleeve Configurations
630	UL 551	Transformer-Type Arc-Welding Machines	
640	UL 13	Power Limited Circuit Cables	
	-	UL 62	Flexible Cords and Cables
	-	UL 813	Commercial Audio Equipment
	-	UL 1310	Class 2 Power Units
	-	UL 1419	Professional Video and Audio Equipment
	-	UL 1492	Audio-Video Products and Accessories
	-	UL 1711	Amplifiers for Fire Protective Signaling Systems
	-	UL 2269	Outline for Optical Fiber/Communications/Signaling /Coaxial Cable Outlet Boxes
	-	UL 6500	Audio/Video and Musical Instrument Apparatus for Household, Commercial, and Similar General Use
	-	UL 60065	Audio, Video and Similar Electronic Apparatus — Safety Requirements
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
645	UL 38	Manual Signaling Boxes for Fire Alarm Systems	

Article	Standard Number	Standard Title	
	-	UL 268	Smoke Detectors for Fire Alarm Systems
	-	UL 444	Communications Cables
	-	UL 464	Audible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories
	-	UL 497B	Protectors for Data Communications and Fire Alarm Circuits
	-	UL 833	Control Units and Accessories for Fire Alarm Systems -
	UL 864	Control Units and Accessories for Fire Alarm Systems	
	-	UL 1425	Cables for Power-Limited Fire-Alarm Circuits
	-	UL 1426	Cables for Non-Power-Limited Fire-Alarm Circuits
	-	UL 1449	Surge Protective Devices
	-	UL 1480	Speakers for Fire Alarm and Signaling Systems, Including Accessories
	-	UL 1638	Visible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories
	-	UL 1651	Optical Fiber Cable
	-	UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
	-	UL 1690	Data-Processing Cable
	-	UL 1778	Uninterruptible Power Systems
	-	UL 2024	Cable Routing Assemblies and Communications Raceways
	-	UL 60950-1	Information Technology Equipment Safety — Part 1: General Requirements
	-	UL 60950-21	Information Technology Equipment Safety — Part 21: Remote Power Feeding
	-	UL 60950-22	Information Technology Equipment Safety — Part 22: Equipment to be Installed Outdoors
	-	UL 60950-23	Information Technology Equipment Safety — Part 23: Large Data Storage Equipment
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
646	UL 10C	Positive Pressure Fire Tests of Door Assemblies	
	-	UL 62	Flexible Cords and Cables
	-	UL 67	Panelboards
	-	UL 98	Enclosed and Dead-Front Switches
	-	UL 305	Panic Hardware
	-	UL 347	Medium-Voltage AC Contactors, Controllers, and Control Centers

Article	Standard Number	Standard Title	
	-	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
	-	UL 508	Industrial Control Equipment
	-	UL 508A	Industrial Control Panels
	-	UL 845	Motor Control Centers
	-	UL 869A	Reference Standard for Service Equipment
	-	UL 891	Switchboards
	-	UL 891A	Switchboards Rated 601–1000 V
	-	UL 924	Emergency Lighting and Power Equipment
	-	UL 977	Fused Power-Circuit Devices
	-	UL 1008	Transfer Switch Equipment
	-	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
	-	UL 1008M	Meter-Mounted Transfer Switches
	-	UL 1008S	Solid-State Transfer Switches
	-	UL 1062	Unit Substations
	-	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	-	UL 1429	Pullout Switches
	-	UL 1449	Surge Protective Devices
	-	UL 1655	Community-Antenna Television Cables
	-	UL 1989	Standby Batteries
	-	UL Subject 2755	Modular Data Centers
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
647	UL 1598	Luminaires	
650	UL 1310	Class 2 Power Units	
	-	UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
670	ANSI/CSA-C22.2 No. 19085-1	Woodworking machines — Safety — Part 1: Common requirements	
	-	UL 508	Industrial Control Equipment
	-	UL 61800-5-1	Adjustable Speed Electrical Power Drive Systems — Part 5-1: Safety Requirements — Electrical, Thermal and Energy
	-	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
	-	UL 489G	Outline for Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures, 650–1000 Volts AC and 650–1500 Volts DC

Article	Standard Number	Standard Title	
675	UL 493	Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables	
	-	UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords
680	UL 6	Electrical Rigid Metal Conduit — Steel	
	-	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	-	UL 20	General Use Snap-Switches
	-	UL 62	Flexible Cords and Cables
	-	UL 360	Liquid-Tight Flexible Metal Conduit
	-	UL 379	Power Units for Fountain, Swimming Pool, and Spa Luminaires
	-	UL 467	Grounding and Bonding Equipment
	-	UL 486D	Sealed Wire Connector Systems
	-	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	-	UL 676	Underwater Luminaires and Submersible Junction Boxes
	-	UL 676A	Potting Compounds for Swimming Pool, Fountain, and Spa Equipment
	-	UL 943	Ground-Fault Circuit-Interrupters
	-	UL 943C	Outline for Special Purpose Ground-Fault Circuit-Interrupters
	-	UL 1004-10	Pool Pump Motors
	-	UL 1060	Circuit Breaker and Ground Fault Circuit Interrupters
	-	UL 1081	Swimming Pool Pumps, Filters, and Chlorinators
	-	UL 1241	Isolated Power Systems Equipment
	-	UL 1242	Electrical Intermediate Metal Conduit - Steel
	-	UL 1261	Electric Water Heaters for Pools and Tubs
	-	UL 1563	Electric Spas, Equipment Assemblies, and Associated Equipment
	-	UL 1569	Metal-Clad Cables
	-	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	-	UL 1795	Hydromassage Bathtubs
	-	UL 2420	Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
	-	UL Subject 2452	Outline of Investigation for Electric Swimming Pool and Spa Cover Operators
	-	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings

Article	Standard Number	Standard Title	
	-	UL 2515A	Supplemental Requirements for Extra Heavy Wall Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
	-	UL 2995	Lifts for Swimming Pools and Spas
	-	UL 60335-2-1000	Household and Similar Electrical Appliances: Particular Requirements for Electrically Powered Pool Lifts
682	UL 486D	Sealed Wire Connector Systems	
	-	UL 1650	Portable Power Cable
690	UL 98B	Enclosed and Dead-Front Switches for Use in Photovoltaic Systems	
	-	UL 248-19	Low-Voltage Fuses — Photovoltaic Fuses
	-	UL 467	Grounding and Bonding Equipment
	-	UL 489B	Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures for Use with Photovoltaic (PV) Systems
	-	UL Subject 508I	Manual Disconnect Switches Intended for Use in Photovoltaic Systems
	-	UL 1569	Metal-Clad Cables
	-	UL 1699B	Photovoltaic DC Arc-Fault Circuit Protection
	-	UL 1703	Flat-Plate Photovoltaic Modules and Panels
	-	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources
	-	UL 2703	Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels
	-	UL 3001	Distributed Energy Generation and Storage Systems
	-	UL 3003	Distributed Generation Cables
	-	UL 3005	Distributed Energy Resource Management Systems
	-	UL Subject 3703	Solar Trackers
	-	UL Subject 3730	Photovoltaic Junction Boxes
	-	UL 3741	Photovoltaic Hazard Control
	-	UL 4703	Photovoltaic Wire
	-	UL 6703	Connectors for Use in Photovoltaic Systems
	-	UL Subject 6703A	Multi-Pole Connectors for Use in Photovoltaic Systems
	-	UL 7103	Outline for Investigation for Building-Integrated Photovoltaic Roof Coverings
	-	UL Subject 8703	Concentrator Photovoltaic Modules and Assemblies
	-	UL 8801	Outline for Photovoltaic-Powered Luminaire Systems
	-	UL Subject 9703	Distributed Wiring Harnesses

Article	Standard Number	Standard Title	
	-	UL 61730-1	Photovoltaic (PV) Module Safety Qualification — Part 1: Requirements for Construction
	-	UL 61730-2	Photovoltaic (PV) Module Safety Qualification — Part 2: Requirements for Testing
	-	UL 62109-1	Power Converters for Use in Photovoltaic Power Systems — Part 1: General Requirements
	-	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
693	-	-	
692	UL 2262	Outline for Fuel Cell Modules for Use in Portable and Stationary Equipment	
	-	UL 2262A	Outline for Borohydride Fuel Cartridges with Integral Fuel Processing for Use with Portable Fuel Cell Power Systems or Similar Equipment
	-	UL 2265	Fuel Cell Power Units and Fuel Storage Containers for Portable Devices
	-	UL 2265A	Outline for Hand-held or Hand-Transportable Fuel Cell Power Units with Disposable Methanol Fuel Cartridges for use in Original Equipment Manufacturer's Information Technology Equipment
	-	UL 2265C	Outline for Hand-Held or Hand-Transportable Alkaline (Direct Borohydride) Fuel Cell Power Units and Borohydride Fuel Cartridges For Use With Consumer Electronics or Information Technology Equipment
	-	UL 2266	Electromagnetic Compatibility, Electrical Safety, and Physical Protection of Stationary and Portable Fuel Cell Power Systems for Use with Commercial Network Telecommunications Equipment
	-	UL 2267	Fuel Cell Power Systems for Installation in Industrial Electric Trucks
-	-	-	
694	UL 467	Grounding and Bonding Equipment	
	-	UL Subject 489C	Molded-Case Circuit Breakers and Molded-Case Switches for Use with Wind Turbines
	-	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources
	-	UL 2227	Outline for Flexible Motor Supply Cable and Wind Turbine Tray Cable
	-	UL 2736	Outline for Single Pole Separable Interconnecting Cable Connectors for Use with Wind Turbine Generating Systems

Article	Standard Number	Standard Title	
	-	UL 4143	Wind Turbine Generator - Life Time Extension (LTE)
	-	UL 6141	Wind Turbines Permitting Entry of Personnel
	-	UL 6142	Wind Turbine Generating Systems — Small
	-	UL 6171	Wind Turbine Converters and Interconnection Systems Equipment
695	UL 6	Electrical Rigid Metal Conduit — Steel	
	-	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	-	UL 218	Fire Pump Controllers
	-	UL 448	Centrifugal Stationary Pumps for Fire-Protection Service
	-	UL 448B	Residential Fire Pumps Intended for One- and Two-Family Dwellings and Manufactured Homes
	-	UL 448C	Stationary, Rotary-Type, Positive-Displacement Pumps for Fire Protection Service
	-	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	-	UL 1004-5	Fire Pump Motors
	-	UL 1242	Electrical Intermediate Metal Conduit — Steel
	-	UL 1569	Metal-Clad Cables
	-	UL 1724	Outline for Fire Tests for Electrical Circuit Protective Systems
	-	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
	-	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
696	-	-	
700	UL 924	Emergency Lighting and Power Equipment	
	-	UL 1008	Transfer Switch Equipment
	-	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
	-	UL 1449	Surge Protective Devices
	-	UL 1724	Outline for Fire Tests for Electrical Circuit Protective Systems
	-	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
	-	UL 2200	Stationary Engine Generator Assemblies
701	UL 924	Emergency Lighting and Power Equipment	
	-	UL 1008	Transfer Switch Equipment

Article	Standard Number	Standard Title	
	-	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
702	UL 1008	Transfer Switch Equipment	
703	-	-	
	-	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
	-	UL 1008M	Meter-Mounted Transfer Switches
	-	UL 1008S	Solid-State Transfer Switches
705	UL 62	Flexible Cords and Cables	
	-	UL 486D	Sealed Wire Connector Systems
	-	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
	-	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	-	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources
	-	UL 2200	Stationary Engine Generator Assemblies
	-	UL 3003	Outline for Distributed Generation Cables
	-	UL 6142	Small Wind Turbine Systems
	-	UL 6171	Wind Turbine Converters and Interconnection Systems Equipment
	-	UL 9540	Energy Storage Systems and Equipment
	-	UL 62109-2	Power Converters for Use in Photovoltaic Power Systems — Part 2: Particular Requirements for Inverters
706	UL 248-2	Low-Voltage Fuses — Part 2: Class C Fuses	
	-	UL 248-3	Low-Voltage Fuses — Part 3: Class CA and CB Fuses
	-	UL 248-4	Low-Voltage Fuses — Part 4: Class CC Fuses
	-	UL 248-5	Low-Voltage Fuses — Part 5: Class G Fuses
	-	UL 248-6	Low-Voltage Fuses — Part 6: Class H Non-Renewable Fuses
	-	UL 248-8	Low-Voltage Fuses — Part 8: Class J Fuses
	-	UL 248-9	Low-Voltage Fuses — Part 9: Class K Fuses
	-	UL 248-12	Low-Voltage Fuses — Part 12: Class R Fuses
	-	UL 248-15	Low-Voltage Fuses — Part 15: Class T Fuses
	-	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures

Article	Standard Number	Standard Title	
	-	UL 489H	Outline for Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures, for Use with Direct Current (DC) Microgrids
	-	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	-	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources
	-	UL 9540	Energy Storage Systems and Equipment
708	UL 1	Flexible Metal Conduit	
	-	UL 4	Armored Cable
	-	UL 83	Thermoplastic-Insulated Wires and Cables
	-	UL 360	Liquid-Tight Flexible Metal Conduit
	-	UL 493	Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables
	-	UL 497A	Secondary Protectors for Communications Circuits
	-	UL 1008	Transfer Switch Equipment
	-	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
	-	UL 1008M	Meter-Mounted Transfer Switches
	-	UL 1008S	Solid-State Transfer Switches
	-	UL 1569	Metal-Clad Cables
	-	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
710	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources	
712	UL 248-2	Low-Voltage Fuses — Part 2: Class C Fuses	
	-	UL 248-3	Low-Voltage Fuses — Part 3: Class CA and CB Fuses
	-	UL 248-4	Low-Voltage Fuses — Part 4: Class CC Fuses
	-	UL 248-5	Low-Voltage Fuses — Part 5: Class G Fuses
	-	UL 248-6	Low-Voltage Fuses — Part 6: Class H Non-Renewable Fuses
	-	UL 248-8	Low-Voltage Fuses — Part 8: Class J Fuses
	-	UL 248-9	Low-Voltage Fuses — Part 9: Class K Fuses
	-	UL 248-12	Low-Voltage Fuses — Part 12: Class R Fuses
	-	UL 248-15	Low-Voltage Fuses — Part 15: Class T Fuses

Article	Standard Number	Standard Title	
	-	UL 498G	Outline for Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures, for Use with Direct Current (DC) Microgrids
	-	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	-	UL 1670	Medium Voltage Circuit Breakers and Metal-Clad Switchgear
	-	UL 1671	Medium Voltage Metal-Clad Switchgear
	-	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources
	-	UL 6142	Small Wind Turbine Systems
	-	UL 6171	Wind Turbine Converters and Interconnection Systems Equipment
	-	UL 9540	Energy Storage Systems and Equipment
	-	UL 60947-1	Low-Voltage Switchgear and Controlgear — Part 1: General Rules
	-	UL 60947-4-1	Low-Voltage Switchgear and Controlgear — Part 4-1: Contactors and Motor-Starters — Electromechanical Contactors and Motor-Starters
	-	UL 62109-2	Power Converters for Use in Photovoltaic Power Systems — Part 2: Particular Requirements for Inverters
725	UL 13	Power-Limited Circuit Cables	
	-	UL 444	Communications Cable
	-	UL 1012	Power Units Other Than Class 2
	-	UL 1277	Electrical Power and Control Tray Cables with Optional Optical-Fiber Members
	-	UL 1310	Class 2 Power Units
	-	UL 1666	Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts
	-	UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
	-	UL 2196	Fire Test for Circuit Integrity of Fire -Resistive Power, Instrumentation, Control and Data Cables
	-	UL 5085-3	Low Voltage Transformers — Part 3: Class 2 and Class 3 Transformers
	-	UL Subject 9990	Information and Communication Technology (ICT) Power Cables
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
726	UL 1400-1 UL 1400-2	*Outline for Fault-Managed Power Systems – Part 1: General Requirements*	
727	UL 2250	*Outline for Fault-Managed Power*	

Article	Standard Number	Standard Title	
		Systems – Part 2: Requirements for Class 4 Cables	
		Instrumentation Tray Cable	
728	UL 5	Surface Metal Raceways and Fittings	
	-	UL 5A	Nonmetallic Surface Raceways and Fittings
	-	UL 5B	Strut-Type Channel Raceways and Fittings
	-	UL 5C	Surface Raceways and Fittings for Use with Data, Signal, and Control Circuits
	-	UL 209	Cellular Metal Floor Raceways and Fittings
	-	UL 467	Grounding and Bonding Equipment
	-	UL 514A	Metallic Outlet Boxes
	-	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	-	UL 568	Nonmetallic Cable Tray Systems
	-	UL 884	Underfloor Raceways and Fittings
	-	UL Subject 1724	Fire Tests for Electrical Circuit Protective Systems
	-	UL 2024	Cable Routing Assemblies and Communications Raceways
	-	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
760	UL 268	Smoke Detectors for Fire Alarm Signaling Systems	
	-	UL 268A	Smoke Detectors for Duct Application
	-	UL 486C	Splicing Wire Connectors
	-	UL 497B	Protectors for Data Communication and Fire Alarm Circuits
	-	UL 1424	Cables for Power-Limited Fire-Alarm Circuits
	-	UL 1425	Cables for Non–Power-Limited Fire-Alarm Circuits
	-	UL 1480	Speakers for Fire Alarm and Signaling Systems, Including Accessories
	-	UL 1666	Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts
	-	UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
	-	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
770	UL 467	Grounding and Bonding Equipment	
	-	UL 568	Nonmetallic Cable Tray Systems
	-	UL 1651	Optical Fiber Cable

Article	Standard Number	Standard Title	
	-	UL 2024	Optical Fiber and Communication Cable Raceway
	-	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
	-	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
800	UL 444	Communications Cables	
	-	UL 467	Grounding and Bonding Equipment
	-	UL 489A	Circuit Breakers for Use in Communication Equipment
	-	UL 497	Protectors for Paired-Conductor Communications Circuits
	-	UL 497A	Secondary Protectors for Communications Circuits
	-	UL 497C	Protectors for Coaxial Communications Circuits
	-	UL Subject 497E	Protectors for Antenna Lead-In Conductors
	-	UL Subject 523	Telephone Service Drop Wire
	-	UL 568	Nonmetallic Cable Tray Systems
	-	UL 723	Test for Surface Burning Characteristics of Building Materials
	-	UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords
	-	UL 1666	Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts
	-	UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
	-	UL 1863	Communication Circuit Accessories
	-	UL 2024	Cable Routing Assemblies and Communications Raceways
	-	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
805	UL 444	Communications Cables	
	-	UL 497	Protectors for Paired-Conductor Communications Circuits
	-	UL 497A	Secondary Protectors for Communications Circuits
	-	UL 497C	Protectors for Coaxial Communications Circuits
	-	UL Subject 497E	Protectors for Antenna Lead-In Conductors
	-	UL Subject 523	Telephone Service Drop Wire
	-	UL 719	Nonmetallic-Sheathed Cables
	-	UL 1310	Class 2 Power Units
	-	UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords

Article	Standard Number	Standard Title	
	-	UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
	-	UL 1863	Communication Circuit Accessories
	-	UL 2043	Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces
	-	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
810	UL 150	Antenna Rotators	
	-	UL 452	Antenna-Discharge Units
	-	UL 467	Grounding and Bonding Equipment
	-	UL Subject 497E	Protectors for Antenna Lead-In Conductors
820	UL 444	Communications Cables	
	-	UL Subject 497E	Protectors for Antenna Lead-In Conductors
	-	UL 1655	Community-Antenna Television Cables
830	UL 444	Communications Cables	
	-	UL 497A	Secondary Protectors for Communications Circuits
	-	UL 497C	Protectors for Coaxial Communications Circuits
	-	UL Subject 497E	Protectors for Antenna Lead-In Conductors
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
840	UL 444	Communications Cables	
	-	UL 467	Grounding and Bonding Equipment
	-	UL 498A	Current Taps and Adapters
	-	UL 1310	Class 2 Power Units
	-	UL 1651	Optical Fiber Cable
	-	UL 1863	Communication Circuit Accessories
	-	UL 2024	Cable Routing Assemblies and Communications Raceways
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
Tables 11(A) and 11(B)	UL 1310	Class 2 Power Units	
	-	UL 1434	Thermistor-Type Devices
	-	UL 5085-3	Class 2 and Class 3 Transformers

Article	Standard Number	Standard Title	
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
Tables 12(A) and 12(B)	UL 1310	Class 2 Power Units	
	-	UL 1434	Thermistor-Type Devices
	-	UL 5085-3	Class 2 and Class 3 Transformers
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements

Additional Proposed Changes

File Name	Description	Approved
.1629918652181	UL 1400-1 & -2 Table of Contents, Normative References and Content Resources	

Statement of Problem and Substantiation for Public Comment

This comment was developed by the participants of a research and development project group assembled by UL to develop safety requirements for Fault Managed Power Systems (FMPS) to reduce the risks of electric shock and fire and facilitate the design, production and use of products that are physically safe. This project is intended to support the First Revision that adds Class 4 circuits to the 2023 National Electrical Code© (NEC©) as a new Article 726. Participant companies include (in alphabetical order) ATIS, Belden, Chemours, Cisco, CommScope, Corning, Daiken, Enersys (formerly Alpha Technologies), Hubbell, Leviton, Panduit, Schneider Electric, Southwire, Superior Essex, Voltserver, and UL. Participation in the project is broad-based and includes representation of those with knowledge and experience in electrical safety, installation, code enforcement, and wire and cable. Participation in the project alone does not imply 100% agreement among the participant companies or individual members with the developed requirements.

The Scope of Work for the project is to develop a fault managed power safety system framework that can be recommended to installation code bodies, that is technically coordinated with existing and new product safety standards, and that enables “listing” of equipment identified for the purpose.

1) Research of pre-existing written and electronic materials
2) Gap analysis of existing codes and standards
3) Study of safety risks and creation of risk mitigation requirements
4) Specifications for cabling, connectivity and equipment
5) Development of new UL Standards encompassing new equipment, components and cables for Class 4 systems and components

During the course of this project, participants conducted research on topics that ranged from electric shock and arc-energy to grounding of separately derived systems. Refer to Attachment 5 for examples of papers and standards used for this research. In addition, significant input was sought from the participating companies to utilize their expertise and experience and aid in the practical resolution of the issues.

As a result of this work, drafts of two new outlines of investigation (standards) have been prepared; UL 1400-1, Outline for Fault-Managed Power Systems – Part 1: General Requirements, and UL 1400-2, Outline for Fault-Managed Power Systems – Part 2: Requirements for Class 4 Cables. Refer to Attachments 1 and 2 for the Table of Contents for these new standards.

These standards are technically coordinated with existing standards while incorporating the requirements necessary to deal with the advanced technology of Class 4 systems. UL 1400-1 is written as a supplement to UL 62368-1, Audio/video, information and communication technology equipment - Part 1: Safety requirements, leveraging the technical expertise of this internationally harmonized standard based on the hazard-based safety engineering (HBSE) principles. UL 1400-2 is based on UL 13, Power-Limited Circuit Cables, and contains all of the requirements necessary to evaluate Class 4 cables. Attachments 3 and 4 identify the normative standard references incorporated into the requirements.

UL’s outline of investigations (standards) describe the requirements used to evaluate products and systems with detailed technical content addressing potential risks and their mitigation. They provide standardized, vendor-neutral and uniform solutions and procedures.

Related Item

• PC 1902 • PC 1904 • PC 1905 • PC 1906

Submitter Information Verification

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Submittal Date: Thu Aug 19 15:08:15 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-7541-NFPA 70-2021

Statement: The annex is revised to reference current safety standards. Part 2 has been added to address product safety standards for conductors and equipment that do not have an associated listing requirement

Public Comment No. 569-NFPA 70-2021 [Section No. A.1]

A.1

Article	Standard Number	Standard Title	
110	UL 10C	Positive Pressure Fire Tests of Door Assemblies	
	-	UL 305	Panic Hardware
	-	UL 486D	Sealed Wire Connector Systems
	-	UL 2043	Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces
	-	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
210	UL 935	Fluorescent-Lamp Ballasts	
	-	UL 943	Ground Fault Circuit Interrupters
	-	UL 1029	High-Intensity-Discharge Lamp Ballast
	-	UL 1699	Arc-Fault Circuit-Interrupters
225	UL 6	Electrical Rigid Metal Conduit — Steel	
	-	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	-	UL 360	Liquid-Tight Flexible Metal Conduit
	-	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	-	UL 1242	Electrical Intermediate Metal Conduit — Steel
	-	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	-	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
230	UL 6	Electrical Rigid Metal Conduit — Steel	
	-	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	-	UL 67	Panelboards
	-	UL 98	Enclosed and Dead-Front Switches
	-	UL 218	Fire Pump Controllers
	-	UL 231	Power Outlets
	-	UL 347	Medium-Voltage AC Contactors, Controllers, and Control Centers
	-	UL 360	Liquid-Tight Flexible Metal Conduit
	-	UL 414	Meter Sockets

Article	Standard Number	Standard Title	
	-	UL 486A-486B	Wire Connectors
	-	UL 486C	Splicing Wire Connectors
	-	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
	-	UL 508	Industrial Control Equipment
	-	UL 508A	Industrial Control Panels
	-	UL 514B	Conduit, Tubing and Cable Fittings
	-	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	-	UL 845	Motor Control Centers
	-	UL 857	Busways
	-	UL 869A	Reference Standard for Service Equipment
	-	UL 891	Switchboards
	-	UL 891A	Switchboards Rated 601–1000 V
	-	UL 977	Fused Power-Circuit Devices
	-	UL 1008	Transfer Switch Equipment
	-	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
	-	UL 1008M	Meter-Mounted Transfer Switches
	-	UL 1008S	Solid-State Transfer Switches
	-	UL 1053	Ground-Fault Sensing and Relaying Equipment
	-	UL 1062	Unit Substations
	-	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	-	UL 1242	Electrical Intermediate Metal Conduit — Steel
	-	UL 1429	Pullout Switches
	-	UL 1449	Surge Protective Devices
	-	UL 1558	Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear
	-	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	-	UL 1740	Robots and Robotic Equipment
	-	UL 1953	Outline for Power Distribution Blocks
-	-	-	
	-	UL 2011	Outline for Machinery
	-	UL 2200	Stationary Engine Generator Assemblies

Article	Standard Number	Standard Title	
	-	UL 2416	Audio/Video, Information and Communication Technology Equipment Cabinet, Enclosure and Rack Systems
	-	UL 2446	Outline for Unitary Boiler Room Systems
	-	UL 2565	Industrial Metalworking and Woodworking Machine Tools
	-	UL 2735	Electric Utility Meters
	-	UL 2745	Outline for Meter Socket Adapters for Communications Equipment
	-	UL 2876	Outline for Remote Racking Devices for Switchgear and Controlgear
	-	UL 4248-1	Fuseholders — Part 1: General Requirements
	-	UL 60947-1	Low-Voltage Switchgear and Controlgear — Part 1: General Rules
	-	UL 61800-5-1	Adjustable Speed Electrical Power Drive Systems — Part 5-1: Safety Requirements — Electrical, Thermal and Energy
240	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures	
	-	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
250	UL 467	Grounding and Bonding Equipment	
300	UL 44	Thermoset-Insulated Wires and Cables	
	-	UL 83	Thermoplastic-Insulated Wires and Cables
	-	UL 83A	Fluoropolymer Insulated Wire
-	-	-	
	-	UL 263	Fire Tests of Building Construction and Materials
	-	UL 756C	Polymeric Materials — Use in Electrical Equipment Evaluations
	-	UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords
	-	UL 2556	Standard for Wire and Cable Test Methods
	-	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation

Article	Standard Number	Standard Title	
310	UL 44	Thermoset-Insulated Wires and Cables	
	-	UL 83	Thermoplastic-Insulated Wires and Cables
	-	UL 83A	Fluoropolymer Insulated Wire
-	-	-	
	-	UL 224	Extruded Insulating Tubing
	-	UL 1063	Machine-Tool Wires and Cables
	-	UL 1441	Coated Electrical Sleeving
311	ANSI C119.4	Electric Connectors — Connectors for Use between Aluminum-to-Aluminum and Aluminum-to-Copper Conductors Designed for Normal Operation at or Below 93ºC and Copper-to-Copper Conductors Designed for Normal Operation at or Below 100ºC	
	-	IEEE 48	IEEE Standard for Test Procedures and Requirements for Alternating-Current Cable Terminations Used on Shielded Cables Having Laminated Insulation Rated 2.5kV through 765 kV or Extruded Insulation Rated 2.5 kV through 500 kV
	-	IEEE 386	IEEE Standard for Separable Insulated Connector Systems for Power Distribution Systems Rated 2.5 kV through 35 kV
	-	IEEE 404	IEEE Standard for Extruded and Laminated Dielectric Shielded Cable Joints Rated 2.5 kV to 500 kV
	-	UL 1072	Medium Voltage Power Cables
312	UL 50	Enclosures for Electrical Equipment	
	-	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	-	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
314	UL 50	Enclosures for Electrical Equipment	
	-	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	-	UL 486D	Sealed Wire Connector Systems

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	-	UL 498	Attachment Plugs and Receptacles
	-	UL 498B	Outline for Receptacles with Integral Switching Means
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection
	-	UL 514A	Metallic Outlet Boxes
	-	UL 514B	Conduit, Tubing, and Cable Fittings
	-	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	-	UL 514D	Cover Plates for Flush-Mounted Wiring Devices
	-	UL 1953	Power Distribution Blocks
320	UL 4	Armored Cable	
322	NEMA Publication No. UC2	Under-carpet Power Distribution Systems	
324	NEMA Publication No. UC2	Under-carpet Power Distribution Systems	
330	UL 1569	Metal-Clad Cables	
	-	UL 2225	Cables and Cable-Fittings For Use In Hazardous (Classified) Locations
332	UL 504	Outline for Mineral-Insulated, Metal-Sheathed Cable	
334	UL 719	Nonmetallic-Sheathed Cables	
	-	UL Subject 2256	Nonmetallic Sheathed Cable Interconnects
336	UL 1277	Electrical Power and Control Tray Cables with Optional Optical-Fiber Members	
337	UL 1309A	Cable for Use in Mobile Installations	
338	UL 854	Service-Entrance Cables	
340	UL 493	Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables	
341	-	-	
342	UL 1242	Electrical Intermediate Metal Conduit — Steel	

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344	UL 6	Electrical Rigid Metal Conduit — Steel	
	-	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
348	UL 1	Flexible Metal Conduit	
	-	UL 62275	Cable Management Systems -- Cable Ties for Electrical Installation
350	UL 360	Liquid-Tight Flexible Steel Conduit	
	-	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
352	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings	
353	UL 651A	Schedule 40 and 80 High Density Polyethylene (HDPE) Conduit	
354	UL 1990	Nonmetallic Underground Conduit with Conductors	
355	UL 2420	Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings	
	-	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
	-	UL 2515A	Supplemental Requirements for Extra-Heavy Wall Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
356	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit	
	-	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
358	UL 797	Electrical Metallic Tubing — Steel	
	-	UL 797A	Electrical Metallic Tubing — Aluminum
360	UL Subject 1652	Flexible Metallic Tubing	
362	UL 1653	Electrical Nonmetallic Tubing	
	-	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
366	UL 870	Wireways, Auxiliary Gutters, and Associated Fittings	

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370	ANSI/CSA C22.2 No. 273	Cablebus	
374	UL 209	Cellular Metal Floor Raceways and Fittings	
	-	UL 360	Liquid-Tight Flexible Metal Conduit
	-	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
376	UL 1953	Power Distribution Blocks	
378	UL 870	Wireways, Auxiliary Gutters, and Associated Fittings	
382	UL 5A	Nonmetallic Surface Raceways and Fittings	
	-	UL183	Manufactured Wiring Systems
	-	UL 467	Grounding and Bonding Equipment
	-	UL 498	Attachment Plugs and Receptacles
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection
	-	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	-	UL 498M	Marine Shore Power Inlets
	-	UL 514D	Cover Plates for Flush-Mounted Wiring Devices
	-	UL 746C	Polymeric Materials - Use in Electrical Equipment Evaluations
	-	UL 943	Ground-Fault Circuit-Interrupters
	-	UL 991	Tests for Safety-Related Controls Employing Solid-State Devices
	-	UL 1077	Supplementary Protectors for Use in Electrical Equipment
	-	UL 1699	Arc-Fault Circuit-Interrupters
	-	UL 1998	Software in Programmable Components
384	UL 5B	Strut-Type Channel Raceways and Fittings	
386	UL 5	Surface Metal Raceways and Fittings	
388	UL 5A	Nonmetallic Surface Raceways and Fittings	

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392	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation	
393	UL 13	Power-Limited Circuit Cables	
	-	UL 50	Enclosures for Electrical Equipment, Non-Environmental Considerations
	-	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	-	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	-	UL 1310	Class 2 and Class 3 Power Supplies
	-	UL 2043	Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces
	-	UL 2577	Suspended Ceiling Power Grid Systems and Equipment
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
396	UL 1072	Medium-Voltage Power Cables	
400	UL 62	Flexible Cords and Cables	
	-	UL 498	Attachment Plugs and Receptacles
	-	UL 498B	Outline for Receptacles with Integral Switching Means
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles - Enclosure Types for Environmental Protection
	-	UL 817	Cord Sets and Power-Supply Cords
	-	UL Subject 1650	Portable Power Cable
402	UL 66	Fixture Wire	
404	UL 20	General-Use Snap Switches	
	-	UL 98	Enclosed and Dead-Front Switches
	-	UL Subject 98A	Open-Type Switches
	-	UL 363	Knife Switches

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	-	UL 773	Plug-In Locking Type Photocontrols for Use with Area Lighting
	-	UL 773A	Nonindustrial Photoelectric Switches for Lighting Control
	-	UL 917	Clock-Operated Switches
	-	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	-	UL 1472	Solid-State Dimming Controls
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	-	UL 60730-1	Automatic Electrical Controls — Part 1: General Requirements
	-	UL 60730-2	Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Timers and Time Switches
	-	ANSI/NEMA WD 6–2016	Wiring Devices — Dimensional Specifications.
406	UL 498	Attachment Plugs and Receptacles	
	-	UL 498B	Receptacles with Integral Switching Means
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles - Enclosure Types for Environmental Protection
	-	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	-	UL 498M	Marine Shore Power Inlets
	-	UL 514A	Metallic Outlet Boxes
	-	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	-	UL 514D	Cover Plates for Flush-Mounted Wiring Devices
	-	UL 943	Ground-Fault Circuit-Interrupters
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	-	UL 1286	Office Furnishings
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	-	UL 1691	Single Pole Locking-Type Separable Connectors
	-	UL 1699	Arc-Fault Circuit-Interrupters
	-	UL 2999	Individual Commercial Office Furnishings
408	UL 44	Thermoset-Insulated Wires and Cables	
	-	UL 67	Panelboards
	-	UL 891	Switchboards
	-	UL 1558	Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear
	-	UL 60947-1	Low-Voltage Switchgear and Controlgear — Part 1: General Rules
	-	UL 60947-4-1	Low-Voltage Switchgear and Controlgear — Part 4-1: Contactors and Motor-Starters — Electromechanical Contactors and Motor-Starters
	-	UL 60947-4-2	Voltage Switchgear and Controlgear — Part 4-2: Contactors and Motor-Starters — AC Semiconductor Motor Controllers and Starters
	-	UL 60947-5-1	Low-Voltage Switchgear and Controlgear — Part 5-1: Control Circuit Devices and Switching Elements — Electromechanical Control Circuit Devices
	-	UL 60947-5-2	Low-Voltage Switchgear and Controlgear — Part 5-2: Control Circuit Devices and Switching Elements — Proximity Switches
	-	UL 60947-7-1	Low-Voltage Switchgear and Controlgear — Part 7-1: Ancillary Equipment — Terminal Blocks for Copper Conductors
	-	UL 60947-7-2	Low-Voltage Switchgear and Controlgear — Part 7-2: Ancillary Equipment — Protective Conductor Terminal Blocks for Copper Conductors
	-	UL 60947-7-3	Low-Voltage Switchgear and Controlgear — Part 7-3: Ancillary Equipment — Safety Requirements for Fuse Terminal Blocks

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	-	UL 508A	Industrial Control Panels
410	ANSI/CSA-C22.2 No. 184.2	Solid-State Controls for Lighting Systems (SSCLS)	
	-	UL 153	Portable Electric Luminaires
	-	UL 496	Lampholders
	-	UL 498	Attachment Plugs and Receptacles
	-	UL 498B	Outline for Receptacles with Integral Switching Means
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles - Enclosure Types for Environmental Protection
	-	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	-	UL 542	Fluorescent Lamp Starters
	-	UL 588	Seasonal and Holiday Decorative Products
	-	UL 935	Fluorescent-Lamp Ballasts
	-	UL 943	Ground-Fault Circuit-Interrupters
	-	UL 970	Merchandising Displays
	-	UL 1029	High-Intensity-Discharge Lamp Ballasts
	-	UL Subject 1029A	Ignitors and Related Auxiliaries for HID Lamp Ballasts
	-	UL 1574	Track Lighting Systems
	-	UL 1598	Luminaires
	-	UL 1598B	Luminaire Reflector Kits for Installation on Previously Installed Fluorescent Luminaires, Supplemental Requirements
	-	UL 1598C	Light-Emitting Diode (LED) Retrofit Luminaire Conversion Kits
	-	UL 1993	Self-Ballasted Lamps and Lamp Adapters
	-	UL 2388	Flexible Lighting Products
	-	UL 8750	Light Emitting Diode (LED) Equipment for Use in Lighting Products
	-	UL 8752	Organic Light Emitting Diode (OLED) Panels

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	-	UL 8753	Field-Replaceable Light Emitting Diode (LED) Light Engines
	-	UL 8754	Holders, Bases and Connectors for Solid-State (LED) Light Engines and Arrays
	-	UL Subject 8800	Horticultural Lighting Equipment
411	UL 234	Low-Voltage Lighting Fixtures for Use in Recreational Vehicles	
	-	UL 1310	Class 2 and Class 3 Power Units
	-	UL 1838	Low-Voltage Landscape Lighting Systems
	-	UL 2108	Low-Voltage Lighting Systems
	-	UL 5085-3	Class 2 and Class 3 Transformers
422	ANSI/CSA-C22.2 No. 339	Hand-held motor-operated electric tools — Safety — Particular requirements for chain beam saws	
	-	UL 22	Amusement and Gaming Machines
	-	UL 73	Motor-Operated Appliances
	-	UL 82	Electric Gardening Appliances
	-	UL 122	Photographic Equipment
	-	UL 141	Garment Finishing Appliances
	-	UL 174	Household Electric Storage Tank Water Heaters
	-	UL 197	Commercial Electric Cooking Appliances
	-	UL 283	Air Fresheners and Deodorizers
	-	UL 399	Drinking Water Coolers
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	-	UL 474	Dehumidifiers
	-	UL 498	Attachment Plugs and Receptacles
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	-	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	-	UL 499	Electric Heating Appliances
	-	UL 507	Electric Fans
	-	UL 514A	Metallic Outlet Boxes

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-	UL 515	Electric Resistance Trace Heating for Commercial Applications
-	UL 561	Floor Finishing Machines
-	UL 574	Electric Oil Heaters
-	UL 621	Ice Cream Makers
-	UL 705	Power Ventilators
-	UL 710B	Recirculating Systems
-	UL 749	Household Dishwashers
-	UL 751	Vending Machines
-	UL 763	Motor-Operated Commercial Food Preparing Machines
-	UL 778	Standard for Motor-Operated Water Pumps
-	UL 834	Heating, Water Supply, and Power Boilers - Electric
-	UL 858	Household Electric Ranges
-	UL 875	Electric Dry-Bath Heaters
-	UL 921	Commercial Dishwashers
-	UL 923	Microwave Cooking Appliances
-	UL 943	Ground-Fault Circuit-Interrupters
-	UL 962	Household and Commercial Furnishings
-	UL 962A	Furniture Power Distribution Units
-	UL 979	Water Treatment Appliances
-	UL 982	Motor-Operated Household Food Preparing Machines
-	UL 987	Stationary and Fixed Electric Tools
-	UL 1017	Vacuum Cleaners, Blower Cleaners, and Household Floor Finishing Machines
-	UL 1026	Household Electric Cooking and Food Serving Appliances
-	UL 1086	Household Trash Compactors
-	UL 1090	Electric Snow Movers
-	UL 1206	Electric Commercial Clothes-Washing Equipment
-	UL 1240	Electric Commercial Clothes-Drying Equipment
-	UL 1278	Movable and Wall- or Ceiling-Hung Electric Room Heaters
-	UL 1447	Electric Lawn Mowers
-	UL 1450	Motor-Operated Air Compressors, Vacuum Pumps, and Painting Equipment
-	UL 1453	Electric Booster and Commercial Storage Tank Water Heaters

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	-	UL 1576	Flashlights and Lanterns
	-	UL 1594	Sewing and Cutting Machines
	-	UL 1647	Motor-Operated Massage and Exercise Machines
	-	UL 1727	Commercial Electric Personal Grooming Appliances
	-	UL 1776	High-Pressure Cleaning Machines
	-	UL 2157	Electric Clothes Washing Machines and Extractors
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	-	UL 2565	Industrial Metalworking and Woodworking Machine Tools
	-	60335-2-3	Household and Similar Electrical Appliances, Part 2: Particular Requirements for Electric Irons
	-	60335-2-8	Household and Similar Electrical Appliances, Part 2: Particular Requirements for Shavers, Hair Clippers, and Similar Appliances
	-	UL 60335-2-24	Household and Similar Electrical Appliances, Part 2: Particular Requirements for Refrigerating Appliances, Ice-Cream Appliances, and Ice-Makers
	-	UL 60335-2-40	Household and Similar Electrical Appliances, Part 2: Particular Requirements for Heating and Cooling
	-	UL 60335-2-67	Household and Similar Electrical Appliances — Safety — Part 2-67: Particular Requirements for Floor Treatment Machines, For Commercial Use
	-	UL 60335-2-68	Household and Similar Electrical Appliances — Safety — Part 2-68: Particular Requirements for Spray Extraction Machines, for Commercial Use -
	UL 60335-2-72	Household and Similar Electrical Appliances — Safety — Part 2-68: Particular Requirements for Spray Extraction Machines, for Commercial Use	
	-	UL 60335-2-79	Household and Similar Electrical Appliances — Safety — Part 2-79: Particular Requirements for High Pressure Cleaners and Steam

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-	UL 60745-1	Hand-Held Motor-Operated Electric Tools — Safety — Part 1: General Requirements
-	UL 60745-2-1	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-1: Particular Requirements for Drills and Impact Drills
-	UL 60745-2-2	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-2: Particular Requirements for Screwdrivers and Impact Wrenches
-	UL 60745-2-3	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-3: Particular Requirements for Grinders, Polishers, and Disk-Type Sanders
-	UL 60745-2-4	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-4: Particular Requirements for Sanders and Polishers Other Than Disk Type
-	UL 60745-2-5	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-5: Particular Requirements for Circular Saws
-	UL 60745-2-6	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-6: Particular Requirements for Hammers
-	UL 60745-2-8	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-8: Particular Requirements for Shears and Nibblers
-	UL 60745-2-9	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-9: Particular Requirements for Tappers
-	UL 60745-2-11	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-11: Particular Requirements for Reciprocating Saws
-	UL 60745-2-12	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-12: Particular Requirements For Concrete Vibrators
-	UL 60745-2-13	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-13: Particular Requirements For Chain Saws
-	UL 60745-2-14	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-14: Particular Requirements for Planers

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-	UL 60745-2-15	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-15: Particular Requirements for Hedge Trimmers
-	UL 60745-2-16	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-16: Particular Requirements for Tackers
-	UL 60745-2-17	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-17: Particular Requirements for Routers and Trimmers
-	UL 60745-2-18	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-18: Particular Requirements For Strapping Tools
-	UL 60745-2-19	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-19: Particular Requirements for Jointers
-	UL 60745-2-20	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-20: Particular Requirements for Band Saws
-	UL 60745-2-21	Hand-Held Motor-Operated Electric Tools — Safety — Part 2-21: Particular Requirements For Drain Cleaners
-	UL 60745-2-22	Hand-Held Motor-Operated electric Tools — Safety — Part 2-22: Particular Requirements for Cut-Off Machines
-	UL 60745-2-23	Hand-Held Motor-Operated electric Tools — Safety — Part 2-23: Particular Requirements for Die Grinders and Small Rotary Tools
-	UL 62841-1	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 1: General Requirements
-	UL 62841-2-1	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-1: Particular Requirements For Hand-Held Drills and Impact Drills
-	UL 62841-2-2	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-2: Particular Requirements For Screwdrivers And Impact Wrenches

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	-	UL 62841-2-3	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-3: Particular Requirements For Hand-Held Grinders, Polishers, and Disk-Type Sanders
	-	UL 62841-2-4	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-4: Particular Requirements For Hand-Held Sanders And Polishers Other Than Disc Type
	-	UL 62841-2-5	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-5: Particular Requirements For Hand-Held Circular Saws
	-	UL 62841-2-8	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-8: Particular Requirements For Hand-Held Shears and Nibblers
	-	UL 62841-2-9	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-9: Particular Requirements For Hand-Held Tappers And Threaders
	-	UL 62841-2-10	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-10: Particular Requirements For Hand-Held Mixers
	-	UL 62841-2-11	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-11: Particular Requirements for Hand-Held Reciprocating Saws
	-	UL 62841-2-14	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-14: Particular Requirements For Hand-Held Planers
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-	UL 62841-2-21	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-21: Particular Requirements For Hand-Held Drain Cleaners
-	UL 62841-3-1	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-1: Particular Requirements For Transportable Table Saws
-	UL 62841-3-4	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-4: Particular Requirements for Transportable Bench Grinders
-	UL 62841-3-6	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-6: Particular Requirements For Transportable Diamond Drills with Liquid System
-	UL 62841-3-9	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-9: Particular Requirements For Transportable Mitre Saws
-	UL 62841-3-10	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-10: Particular Requirements for Transportable Cut-Off Machines
-	UL 62841-3-12	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-12: Particular Requirements for Transportable Threading Machines
-	UL 62841-3-13	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-13: Particular Requirements For Transportable Drills
-	UL 62841-3-14	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-14: Particular Requirements

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			for Transportable Drain Cleaners
	-	UL 62841-3-1000	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-1000: Particular Requirements for Transportable Laser Engravers
	-	UL 62841-4-1	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 4-1: Particular Requirements for Chain Saws
	-	UL 62841-4-2	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 4-2: Particular Requirements for Hedge Trimmers
	-	UL 62841-4-1000	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 4-1000: Particular Requirements For Utility Machines
424	UL 499	Electric Heating Appliances	
	-	UL 1042	Electric Baseboard Heating Equipment
	-	UL 1673	Electric Space Heating Cables
	-	UL 1693	Electric Radiant Heating Panels and Heating Panel Sets
	-	UL 1995	Heating and Cooling Equipment
	-	UL 1996	Electric Duct Heaters
	-	UL 2021	Fixed and Location-Dedicated Electric Room Heaters
	-	UL 2683	Electric Heating Products for Floor and Ceiling Installation
425	UL 508	Industrial Control Equipment	
	-	UL 2021	Fixed and Location-Dedicated Electric Room Heaters
426	IEEE 515	Electrical Resistance Heat Tracing for Industrial Applications	
	-	UL Subject 1588	Roof and Gutter De-Icing Cable Units
	-	UL Subject 2049	Residential Pipe Heating Cable
427	IEEE 515	Electrical Resistance Heat Tracing for Industrial Applications	

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	-	UL 515	Electrical Resistance Heat Tracing for Commercial and Industrial Applications
	-	UL Subject 2049	Residential Pipe Heating Cable
430	UL 4	Armored Cable	
	-	UL 98	Enclosed and Dead-Front Switches
	-	UL 347	Medium-Voltage AC Contactors, Controllers, and Control Centers
	-	UL 347A	Medium Voltage Power Conversion Equipment
	-	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
	-	UL 508	Industrial Control Equipment
	-	UL 705	Power Ventilators
	-	UL 745-1	Portable Electric Tools
	-	UL 845	Motor Control Centers
	-	UL 987	Stationary and Fixed Electric Tools
	-	UL 1004-1	Rotating Electrical Machines — General Requirements
	-	UL 1004-2	Impedance Protected Motors
	-	UL 1004-3	Thermally Protected Motors
	-	UL 1004-6	Servo and Stepper Motors
	-	UL 1004-7	Electronically Protected Motors
	-	UL 1004-8	Inverter Duty Motors
	-	UL 1004-9	Medium Voltage and Form Wound Motors
	-	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	-	UL 1569	Metal Clad Cables
	-	UL 1812	Ducted Heat Recovery Ventilators
	-	UL 1815	Nonducted Heat Recovery Ventilators
	-	UL 2111	Overheating Protection for Motors
	-	UL 2565	Industrial Metalworking and Woodworking Machine Tools
	-	UL 60034-1	Rotating Electrical Machines
	-	UL 60335-2-40	Household and Similar Electrical Appliances — Part 2: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers
	-	UL 60730-2-22	Automatic Electrical Controls — Part 2: Particular Requirements for Thermal Motor Protectors

Article	Standard Number	Standard Title
	-	UL 60745-1	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery - Safety - Part 1: General Requirements
	-	UL 60745-2-1	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-1: Particular Requirements For Hand-Held Drills and Impact Drills
	-	UL 60745-2-2	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-2: Particular Requirements For Screwdrivers And Impact Wrenches
	-	UL 60745-2-3	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-3: Particular Requirements For Hand-Held Grinders, Polishers, and Disk-Type Sanders
	-	UL 60745-2-4	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-4: Particular Requirements For Hand-Held Sanders And Polishers Other Than Disc Type
	-	UL 60745-2-5	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-5: Particular Requirements For Hand-Held Circular Saws
	-	UL 60745-2-8	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-8: Particular Requirements For Hand-Held Shears and Nibblers
	-	UL 60947-1	Low-Voltage Switchgear and Controlgear — Part 1: General Rules
	-	UL 60947-4-1	Low-Voltage Switchgear and Controlgear — Part 4-1: Contactors and Motor-Starters — Electromechanical Contactors and Motor-Starters
	-	UL 60947-4-2	Low-Voltage Switchgear and Controlgear — Part 4-2: Contactors and Motor-Starters

Article	Standard Number	Standard Title
		— AC Semiconductor Motor Controllers and Starters
-	UL 60947-5-1	Low-Voltage Switchgear and Controlgear — Part 5-1: Control Circuit Devices and Switching Elements — Electromechanical Control Circuit Devices
-	UL 60947-5-2	Low-Voltage Switchgear and Controlgear — Part 5-2: Control Circuit Devices and Switching Elements — Proximity Switches
-	UL 61800-5-1	Adjustable Speed Electrical Power Drive Systems — Part 5-1: Safety Requirements — Electrical, Thermal and Energy
-	UL 62841-2-9	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-9: Particular Requirements For Hand-Held Tappers And Threaders
-	UL 62841-2-10	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-10: Particular Requirements For Hand-Held Mixers
-	UL 62841-2-11	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-11: Particular Requirements for Hand-Held Reciprocating Saws
-	UL 62841-2-14	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-14: Particular Requirements For Hand-Held Planers
-	UL 62841-2-17	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-17: Particular Requirements For Hand-Held Routers
-	UL 62841-2-21	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 2-21: Particular Requirements For Hand-Held Drain Cleaners
-	UL 62841-3-1	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-1: Particular Requirements

Article	Standard Number	Standard Title	
			For Transportable Table Saws
	-	UL 62841-3-4	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-4: Particular Requirements for Transportable Bench Grinders
	-	UL 62841-3-6	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-6: Particular Requirements For Transportable Diamond Drills with Liquid System
	-	UL 62841-3-9	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-9: Particular Requirements For Transportable Mitre Saws
	-	UL 62841-3-10	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-10: Particular requirements for Transportable Cut-Off Machines
	-	UL 62841-3-12	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-12: Particular requirements for Transportable Threading Machines
	-	UL 62841-3-13	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-13: Particular Requirements For Transportable Drills
	-	UL 62841-3-14	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-14: Particular requirements for Transportable Drain Cleaners
	-	UL 62841-3-1000	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 3-1000: Particular Requirements for Transportable Laser Engravers
	-	UL 62841-4-1	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part

Article	Standard Number	Standard Title	
	-	UL 62841-4-2	4-1: Particular Requirements for Chain Saws Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 4-2: Particular Requirements for Hedge Trimmers
	-	UL 62841-4-1000	Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery — Safety — Part 4-1000: Particular Requirements For Utility Machines
440	UL 416	Refrigerated Medical Equipment	
	-	UL 484	Room Air Conditioners
	-	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
	-	UL 508	Industrial Control Equipment
	-	UL 541	Refrigerated Vending Machines
	-	UL 563	Ice Makers
	-	UL 1995	Heating and Cooling Equipment
	-	UL 60335-2-24	Household and Similar Electrical Appliances, Part 2: Particular Requirements for Refrigerating Appliances, Ice-Cream Appliances and Ice-Makers
	-	UL 60335-2-40	Household and Similar Electrical Appliances, Part 2: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers
	-	UL 60335-2-89	Household and Similar Electrical Appliances - Safety - Part 2-89: Particular Requirements for Commercial Refrigerating Appliances with an Incorporated or Remote Refrigerant Unit or Compressor
445	UL 508	Industrial Control Equipment	
	-	UL 943C	Outline for Special Purpose Ground-Fault Circuit-Interrupters
	-	UL 973	Ground-Fault Circuit-Interrupters
	-	UL 1004-4	Electric Generators
	-	UL 2200	Stationary Engine Generator Assemblies
450	UL 10C	Positive Pressure Fire Tests of Door Assemblies	

Article	Standard Number	Standard Title	
	-	UL 305	Panic Hardware
	-	UL 340	Tests for Comparative Flammability of Liquids
480	UL 10C	Positive Pressure Fire Tests of Door Assemblies	
	-	UL 305	Panic Hardware
	-	UL 1642	Lithium Batteries
	-	UL 1973	Batteries for Use in Stationary, Vehicle Auxiliary Power and Light Electric Rail (LER) Applications
	-	UL 1989	Standby Batteries
	-	UL 2054	Household and Commercial Batteries
	-	UL 4127	Outline for Low Voltage Battery Cable
	-	UL 4128	Intercell and Intertier Connectors for use in Electrochemical Battery System Applications
490	UL 347	Medium-Voltage AC Contactors, Controllers, and Control Centers	
	-	UL 347A	Medium Voltage Power Conversion Equipment
	-	UL Subject 347B	Medium Voltage Motor Controllers, Up to 15kV
	-	UL Subject 347C	Medium Voltage Solid State Resistive Load Controllers, Up to 15kV
	-	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
	-	UL 1671	Medium Voltage Metal-Clad Switchgear
500	IEEE 844.1	Skin Effect Trace Heating of Pipelines, Vessels, Equipment, and Structures - General, Testing, Marking, and Documentation Requirements	
	-	NFPA 496	Standard for Purged and Pressurized Enclosures for Electrical Equipment
	-	UL 514B	Conduit, Tubing, and Cable Fittings
	-	UL 913	Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous (Classified) Locations
	-	UL 1203	Explosionproof and Dust-Ignition-Proof Electrical Equipment for Use in

Article	Standard Number	Standard Title	
			Hazardous (Classified) Locations
	-	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
	-	UL 60079-28	Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation.
	-	UL 60079-29-1	Explosive Atmospheres — Part 29-1: Gas Detectors — Performance Requirements of Detectors for Flammable Gases
	-	UL 60079-30-1	Explosive Atmospheres — Electrical Resistance Trace Heating — General and Testing Requirements
	-	UL 121201	Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations
501	ISA 12.12.01	Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations	
	-	NFPA 496	Purged and Pressurized Enclosures for Electrical Equipment
	-	UL 1	Flexible Metal Conduit
	-	UL 13	Power Limited Circuit Cables
	-	UL 248-2	Low-Voltage Fuses — Part 2: Class C Fuses
	-	UL 248-3	Low-Voltage Fuses — Part 3: Class CA and CB Fuses
	-	UL 248-4	Low-Voltage Fuses — Part 4: Class CC Fuses
	-	UL 248-5	Low-Voltage Fuses — Part 5: Class G Fuses
	-	UL 248-6	Low-Voltage Fuses — Part 6: Class H Non-Renewable Fuses
	-	UL 248-8	Low-Voltage Fuses — Part 8: Class J Fuses
	-	UL 248-9	Low-Voltage Fuses — Part 9: Class K Fuses
	-	UL 248-12	Low-Voltage Fuses — Part 12: Class R Fuses
	-	UL 248-15	Low-Voltage Fuses — Part 15: Class T Fuses
	-	UL 467	Grounding and Bonding Equipment

Article	Standard Number	Standard Title	
	-	UL 504	Outline for Mineral-Insulated, Metal-Sheathed Cable
	-	UL 674	Electric Motors and Generators for Use in Hazardous (Classified) Locations
	-	UL 783	Electric Flashlights and Lanterns for Use in Hazardous (Classified) Locations
	-	UL 823	Standard for Electric Heaters For Use in Hazardous (Classified) Locations
	-	UL 844	Luminaires for Use in Hazardous (Classified) Locations
	-	UL 1072	Medium-Voltage Power Cables
	-	UL 1203	Explosionproof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations
	-	UL 1272	Electrical Power and Control Tray Cables with Optional Optical-Fiber Members
	-	UL 1309A	P-Cables
	-	UL 1389	Standard for Plant Oil Extraction Equipment for Installation and Use in Ordinary (Unclassified) Locations and Hazardous (Classified) Locations
	-	UL 1569	Metal-Clad Cables
	-	UL 1836	Outline of Investigation for Electric Motors and Generators for Use in Class I, Division 2, Class I, Zone 2, Class II, Division 2 and Zone 22 Hazardous (Classified) Locations
	-	UL 2011 (Part 3)	Outline of Investigation for Machinery
	-	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
	-	UL 2515A	Supplemental Requirements for Extra Heavy Wall Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
	-	UL 2874	Outline of Investigation for Electric Motors for Use in Hazardous (Classified) Locations - Protection by Pressurized Atmosphere Maintained above the UFL

Article	Standard Number	Standard Title	
	-	UL 4300	Outline of Investigation for Electrically Heated Insulated Covers for Compressed Gas Cylinders for Use in Hazardous (Classified) Locations
	-	UL 60079-28	Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation
	-	UL 60079-30-1	Explosive Atmospheres — Electrical Resistance Trace Heating — General and Testing Requirements
	-	UL 121201	Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations
	-	UL 121303	Guide for Combustible Gas Detection as a Method of Protection
	-	UL 122701	Requirements for Process Sealing Between Electrical Systems and Potentially Flammable or Combustible Process Fluids
502	NFPA 496	Purged and Pressurized Enclosures for Electrical Equipment	
	-	UL 13	Power Limited Circuit Cables
	-	UL 674	Electric Motors and Generators for Use in Hazardous (Classified) Locations
	-	UL 783	Electric Flashlights and Lanterns for Use in Hazardous (Classified) Locations
	-	UL 823	Standard for Electric Heaters For Use in Hazardous (Classified) Locations
	-	UL 844	Luminaires for Use in Hazardous (Classified) Locations
	-	UL 1203	Explosionproof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations
	-	UL 1309	Marine Shipboard Cable
	-	UL 1836	Outline of Investigation for Electric Motors and Generators for Use in Class I, Division 2, Class I, Zone 2, Class II, Division 2 and Zone 22 Hazardous (Classified) Locations.

Article	Standard Number	Standard Title	
	-	UL 2011 (Part 3)	Outline of Investigation for Machinery
	-	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
	-	UL 2250	Instrumentation Tray Cable
	-	UL 60079-28	Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation.
	-	UL 60079-30-1	Explosive Atmospheres — Electrical Resistance Trace Heating — General and Testing Requirements
	-	UL 121201	Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations
503	UL 13	Power Limited Circuit Cables	
	-	UL 823	Standard for Electric Heaters For Use in Hazardous (Classified) Locations
	-	UL 844	Luminaires for Use in Hazardous (Classified) Locations
	-	UL 1203	Explosionproof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations
	-	UL 1836	Outline of Investigation for Electric Motors and Generators for Use in Class I, Division 2, Class I, Zone 2, Class II, Division 2 and Zone 22 Hazardous (Classified) Locations
	-	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
	-	UL 2250	Instrumentation Tray Cable
	-	UL 121201	Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations
504	UL 698A	Standard for Industrial Control Panels Relating to Hazardous (Classified) Locations	
	-	UL 913	Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous (Classified)

Article	Standard Number	Standard Title	
			Locations
	-	UL 120202	Recommendations for the Preparation, Content, and Organization of Intrinsic Safety Control Drawings
505	IEEE 844.1	Skin Effect Trace Heating of Pipelines, Vessels, Equipment, and Structures — General, Testing, Marking, and Documentation Requirements	
-	-	-	
	-	UL 13	Power Limited Circuit Cables
	-	UL 674	Electric Motors and Generators for Use in Hazardous (Classified) Locations
	-	UL 1203	Explosionproof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations
	-	UL 1309	Marine Shipboard Cable
	-	UL 1389	Standard for Plant Oil Extraction Equipment for Installation and Use in Ordinary (Unclassified) Locations and Hazardous (Classified) Locations
	-	UL 2011 (Part 3)	Outline of Investigation for Machinery
	-	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
	-	UL 2250	Instrumentation Tray Cable
	-	UL 2874	Outline for Electric Motors for Use in Hazardous (Classified) Locations — Protection by Pressurized Atmosphere Maintained above the UFL
	-	UL 60079-0	Explosive Gas Atmospheres — Part 0: Equipment — General Requirements
	-	UL 60079-1	Explosive Gas Atmospheres — Part 1: Type of Protection — Flameproof “d”
	-	UL 60079-2	Standard for Explosive Atmospheres — Part 2: Equipment protection by pressurized enclosure “p”
	-	UL 60079-5	Explosive Gas Atmospheres — Part 5: Type of Protection — Powder Filling “q”

Article	Standard Number	Standard Title
-	UL 60079-6	Standard for Explosive Atmospheres — Part 6: Equipment Protection by Liquid Immersion “o”
-	UL 60079-7	Explosive Gas Atmospheres — Part 7: Increased Safety “e”
-	UL 60079-10-1	Part 10-1: Classification of Areas — Explosive Gas Atmospheres
-	UL 60079-11	Explosive Atmospheres — Part 11: Equipment Protection by Intrinsic Safety “i”
-	UL 60079-13	Standard for Explosive Atmospheres — Part 13: Equipment Protection by Pressurized Room “p” and Artificially Ventilated Room “v”
-	UL 60079-15	Electrical Apparatus for Explosive Gas Atmospheres — Part 15: Type of Protection “n”
-	UL 60079-18	Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection — Encapsulation “m”
-	UL 60079-25	Explosive Atmospheres — Part 25: Intrinsically Safe Electrical Systems
-	UL 60079-26	Standard for Explosive Atmospheres — Part 26: Equipment with Equipment Protection Level (EPL) Ga
-	UL 60079-28	Standard for Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation
-	UL 60079-29-1	Explosive Atmospheres — Part 29-1: Gas Detectors — Performance Requirements of Detectors for Flammable Gases
-	UL 60079-29-4	Explosive Atmospheres — Part 29-4: Gas Detectors — Performance Requirements of Open Path Detectors for Flammable Gases
-	UL 60079-30-1	Standard for Explosive Atmospheres — Part 30-1: Electrical Resistance Trace Heating - General and Testing Requirements
-	UL 122001	General Requirements for Electrical Ignition Systems for Internal Combustion Engines in Class I, Division 2 or Zone 2, Hazardous (Classified) Locations

Article	Standard Number	Standard Title	
	-	UL 122701	Requirements for Process Sealing Between Electrical Systems and Flammable or Combustible Process Fluids
506	IEEE 844.1	Skin Effect Trace Heating of Pipelines, Vessels, Equipment, and Structures — General, Testing, Marking, and Documentation Requirements	
-	-	-	
	-	UL 13	Power Limited Circuit Cables
	-	UL 1277	Electrical Power and Control Tray Cables with Optional Optical-Fiber Members
	-	UL 2011 (Part 3)	Outline of Investigation for Machinery
	-	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
	-	UL 60079-0	Explosive Gas Atmospheres — Part 0: Equipment — General Requirements
	-	UL 60079-2	Standard for Explosive atmospheres — Part 2: Equipment protection by pressurized enclosure 'p'
	-	UL 60079-10-2	Part 10-2: Classification of Areas — Combustible Dust Atmospheres
	-	UL 60079-11	Explosive Atmospheres — Part 11: Equipment Protection by Intrinsic Safety "i"
	-	UL 60079-18	Electrical Apparatus for Use in Class I, Zone 1 Hazardous (Classified) Locations Type of Protection — Encapsulation “m”
	-	UL 60079-28	Standard for Explosive Atmospheres — Part 28: Protection of Equipment and Transmission Systems Using Optical Radiation
	-	UL 60079-30-1	Explosive Atmospheres — Electrical Resistance Trace Heating — General and Testing Requirements
	-	UL 60079-31	Explosive Atmospheres — Part 31: Equipment Dust Ignition Protection by Enclosure “t”
	-	UL 62784	Vacuum Cleaners and Dust Extractors Providing Equipment Protection Level Dc for the Collection of Combustible Dusts — Particular Requirements

Article	Standard Number	Standard Title	
511	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations	
	-	UL 122701	Requirements for Process Sealing Between Electrical Systems and Flammable or Combustible Process Fluids
514	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations	
515	UL 844	Luminaires for Use in Hazardous (Classified) Locations	
516	-	-	
517	AAMI ES60601-1	Medical electrical equipment— Part 1: General requirements for basic safety and essential performance	
	-	ES-60601-1	AAMI Medical Electrical Equipment — Part 1: General Requirements for Basic Safety and Essential Performance
	-	UL 5	Surface Metal Raceways and Fittings
	-	UL 5A	Nonmetallic Surface Raceways and Fittings
	-	UL 467	Grounding and Bonding Equipment
	-	UL 498	Attachment Plugs and Receptacles
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection
	-	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	-	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	-	UL 1022	Line Isolation Monitors
	-	UL 1047	Isolated Power Systems Equipment
	-	UL 2930	Cord-and-Plug-connected Health Care Facility Outlet Assemblies
	-	UL 60601-1	Medical Electrical Equipment — Part 1: General Requirements for Safety

Article	Standard Number	Standard Title	
	-	UL 122701	Requirements for Process Sealing Between Electrical Systems and Flammable or Combustible Process Fluids
518	UL 498	Attachment Plugs and Receptacles	
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection
	-	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	-	UL 943	Ground-Fault Circuit-Interrupters
	-	UL 943C	Outline for Special Purpose Ground-Fault Circuit-Interrupters
520	UL 62	Flexible Cords and Cables	
	-	UL Subject 334	Theater Lighting Distribution and Control Equipment
	-	UL 1573	Stage and Studio Luminaires and Connector Strips
	-	UL 1640	Portable Power-Distribution Equipment
	-	UL 1691	Single Pole Locking-Type Separable Connectors
522	UL 13	Power Limited Circuit Cables	
	-	UL 1063	Machine-Tool Wires and Cables
	-	UL 2250	Instrumentation Tray Cable
525	UL 62	Flexible Cords and Cables	
	-	UL 817	Cord Sets and Power-Supply Cords
	-	UL 943	Ground-Fault Circuit-Interrupters
	-	UL 943C	Outline for Special Purpose Ground-Fault Circuit-Interrupters
	-	UL 1691	Single Pole Locking-Type Separable Connectors
530	UL 62	Flexible Cords and Cables	
	-	UL 1479	Fire Tests of Penetration Firestops
	-	UL 1573	Stage and Studio Luminaires and Connector Strips
	-	UL 1680	Outline for Stage and Lighting Cables

Article	Standard Number	Standard Title	
	-	UL 1691	Single Pole Locking-Type Separable Connectors
	-	UL 1836	Outline of Investigation for Electric Motors and Generators for Use in Class I, Division 2, Class I, Zone 2, Class II, Division 2 and Zone 22 Hazardous (Classified) Locations
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment - Part 1: Safety Requirements
540	UL 62368-1	Audio/Video, Information and Communication Technology Equipment - Part 1: Safety Requirements	
545	UL 5	Surface Metal Raceways and Fittings	
	-	UL 5A	Nonmetallic Surface Raceways and Fittings
	-	UL 5B	Strut-Type Channel Raceways and Fittings
	-	UL 5C	Surface Raceways and Fittings for Use with Data, Signal, and Control Circuits
	-	UL 20	General Use Snap Switches
	-	UL 209	Cellular Metal Floor Raceways and Fittings
	-	UL 498	Plugs and Receptacles
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection
	-	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	-	UL 514A	Metallic Outlet Boxes
	-	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	-	UL 2024	Cable Routing Assemblies and Communications Raceways
547	UL 50	Enclosures for Electrical Equipment, Non-Environmental Considerations	
	-	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations

Article	Standard Number	Standard Title	
	-	UL 62	Flexible Cords and Cables
	-	UL 514A	Metallic Outlet Boxes
	-	UL 514B	Conduit, Tubing, and Cable Fittings
	-	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	-	UL 1598	Luminaires
	-	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
550	UL 6	Electrical Rigid Metal Conduit - Steel	
	-	UL 6A	Electrical Rigid Metal Conduit - Aluminum, Red Brass and Stainless Steel
	-	UL 83	Thermoplastic-Insulated Wires and Cables
	-	UL 234	Low Voltage Lighting Fixtures for Use in Recreational Vehicles
	-	UL 307A	Liquid Fuel-Burning Heating Appliances for Manufactured Homes and Recreational Vehicles
	-	UL 307B	Gas-Burning Heating Appliances for Manufactured Homes and Recreational Vehicles
	-	UL 360	Liquid-Tight Flexible Metal Conduit
	-	UL 467	Grounding and Bonding Equipment
	-	UL 498	Plugs and Receptacles
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles - Enclosure Types for Environmental Protection
	-	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	-	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	-	UL 817	Cord Sets and Power-Supply Cords
	-	UL 1242	Electrical Intermediate Metal Conduit — Steel
	-	UL Subject 1462	Mobile Home Pipe Heating Cable

Article	Standard Number	Standard Title	
	-	UL 1598	Luminaires
	-	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	-	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
551	UL 6	Electrical Rigid Metal Conduit — Steel	
	-	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	-	UL 62	Flexible Cords and Cables
	-	UL 231	Power Outlets
	-	UL 360	Liquid-Tight Flexible Metal Conduit
	-	UL 467	Grounding and Bonding Equipment
	-	UL 486C	Splicing Wire Connectors
	-	UL 498	Attachment Plugs and Receptacles
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection
	-	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	-	UL 514A	Metallic Outlet Boxes
	-	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	-	UL 514D	Cover Plates for Flush-Mounted Wiring Devices
	-	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	-	UL 817	Cord Sets and Power-Supply Cords
	-	UL 943	Ground-Fault Circuit-Interrupters
	-	UL 1004-4	Electric Generators
	-	UL 1008	Transfer Switch Equipment
	-	UL 1008M	Outline for Transfer Switch Equipment, Meter Mounted
	-	UL 1008S	Solid-State Transfer Switches
	-	UL 1242	Electrical Intermediate Metal Conduit — Steel
	-	UL 1449	Surge Protective Devices

Article	Standard Number	Standard Title	
	-	UL 1598	Luminaires
	-	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	-	UL 2200	Stationary Engine Generator Assemblies
	-	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
552	SAE J1128-2015	Low Voltage Primary Cable, for Types GXL, HDT, and SXL	
	-	SAE J1127-2015	Low Voltage Battery Cable, for Types SGT and SGR
	-	UL 6	Electrical Rigid Metal Conduit — Steel
	-	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	-	UL 50	Enclosures for Electrical Equipment, Non-Environmental Considerations
	-	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	-	UL 62	Flexible Cords and Cables
	-	UL 67	Panelboards
	-	UL 231	Power Outlets
	-	UL 234	Low Voltage Lighting Fixtures for Use in Recreational Vehicles
	-	UL 360	Liquid-Tight Flexible Metal Conduit
	-	UL 430	Waste Disposers
	-	UL 467	Grounding and Bonding Equipment
	-	UL 514A	Metallic Outlet Boxes
	-	UL 514B	Conduit, Tubing, and Cable Fittings
	-	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	-	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	-	UL 817	Cord Sets and Power-Supply Cords
	-	UL 916	Energy Management Equipment
	-	UL 943	Ground-Fault Circuit-Interrupters
	-	UL 1004-4	Electric Generators
	-	UL 1242	Electrical Intermediate Metal Conduit — Steel

Article	Standard Number	Standard Title	
	-	UL 1563	Electric Spas, Equipment Assemblies, and Associated Equipment
	-	UL 1598	Luminaires
	-	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	-	UL 2200	Stationary Engine Generator Assemblies
	-	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
555	UL 6	Electrical Rigid Metal Conduit — Steel	
	-	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	-	UL 231	Power Outlets
	-	UL 486D	Sealed Wire Connector Systems
	-	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	-	UL 1650	Portable Power Cable
	-	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
590	UL 496	Lampholders	
	-	UL 514B	Conduit, Tubing, and Cable Fittings
	-	UL 588	Seasonal and Holiday Decorative Products
	-	UL 817	Cord Sets
	-	UL 943	Ground-Fault Circuit-Interrupters
	-	UL 1377	Outline for Wire used in Low Voltage Seasonal Lighting Products In Circuits With a Maximum Available Power of 15W
	-	UL 1838	Low Voltage Landscape Lighting Systems
	-	UL 2108	Low Voltage Lighting Systems
600	UL 1	Flexible Metal Conduit	
	-	UL 5	Surface Metal Raceways and Fittings
	-	UL 5A	Nonmetallic Surface Raceways and Fittings
	-	UL 13	Power-Limited Circuit Cables
	-	UL 48	Electric Signs
	-	UL 50	Enclosures for Electrical Equipment, Non-Environmental Considerations

Article	Standard Number	Standard Title	
	-	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	-	UL 98B	Outline for Enclosed and Dead-Front Switches for Use in Photovoltaic Systems
	-	UL 248-19	Low-Voltage Fuses — Part 19: Photovoltaic Fuses
	-	UL 360	Liquid-Tight Flexible Metal Conduit
	-	UL 489B	Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures For Use With Photovoltaic (PV) Systems
	-	UL 508I	Outline for Disconnect Switches Intended for Use in Photovoltaic Systems
	-	UL 814	Gas-Tube-Sign Cable
	-	UL 879	Electric Sign Components
	-	UL 879A	LED Sign and Sign Retrofit Kits
	-	UL Subject 879B	Polymeric Enclosure Systems for the Splice Between Neon Tubing Electrode Leads and GTO Cable, and the GTO Cable Leading to the Splice
	-	UL 943	Ground-Fault Circuit-Interrupters
	-	UL 1310	Class 2 and Class 3 Power Units
	-	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	-	UL 1699B	Photovoltaic (PV) DC Arc-Fault Circuit Protection
	-	UI 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources
	-	UL 2161	Neon Transformers and Power Supplies
	-	UL 2703	Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels
	-	UL 3001	Distributed Energy Generation and Storage Systems
	-	UL 3003	Outline for Distributed Generation Cables
	-	UL 3703	Solar Trackers
	-	UL 4248-18	Outline for Fuseholders — Part 18: Photovoltaic
	-	UL 4703	Photovoltaic Wire

Article	Standard Number	Standard Title	
	-	UL 6703	Connectors for Use in Photovoltaic Systems
	-	UL 7103	Outline for Investigation for Building-Integrated Photovoltaic Roof Coverings
	-	UL 8703	Outline for Concentrator Photovoltaic Modules and Assemblies
	-	UL 8801	Outline for Photovoltaic-Powered Luminaire Systems
	-	UL 9703	Outline for Distributed Generation Wiring Harnesses
	-	UL 61730-1	Photovoltaic (PV) Module Safety Qualification — Part 1: Requirements For Construction
	-	UL 61730-2	Photovoltaic (PV) Module Safety Qualification — Part 2: Requirements For Testing
	-	UL 62109	Power Converters for Use in Photovoltaic Power Systems — Part 1: General Requirements
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
604	UL 1	Flexible Metal Conduit	
	-	UL 4	Armored Cable
	-	UL 5	Surface Metal Raceways and Fittings
	-	UL 5A	Nonmetallic Surface Raceways and Fittings
	-	UL 5B	Strut-Type Channel Raceways and Fittings
	-	UL 5C	Surface Raceways and Fittings for Use with Data, Signal, and Control Circuits
	-	UL 62	Flexible Cords and Cables
	-	UL 183	Manufactured Wiring Systems
	-	UL 209	Cellular Metal Floor Raceways and Fittings
	-	UL 360	Liquid-Tight Flexible Metal Conduit
	-	UL 857	Busways
	-	UL 1569	Metal-Clad Cables
	-	UL 2024	Cable Routing Assemblies and Communications Raceways
605	UL 962	Household and Commercial Furnishings	
	-	UL 1286	Office Furnishings
	-	UL 1310	Class 2 and Class 3 Power Units

Article	Standard Number	Standard Title	
	-	UL 2999	Individual Commercial Office Furnishings
	-	UL 5085	Class 2 and Class 3 Transformers
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment - Part 1: Safety Requirements
610	UL 62	Flexible Cords and Cables	
	-	UL Subject 2273	Festoon Cable
620	UL 62	Flexible Cords and Cables	
	-	UL 83	Thermoplastic-Insulated Wires and Cables
	-	UL 104	Elevator Door Locking Devices and Contacts
	-	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
	-	UL 508	Industrial Control Equipment
	-	UL 508A	Industrial Control Panels
	-	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	-	UL 1310	Class 2 Power Units
	-	UL 1449	Surge Protective Devices
	-	UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
	-	UL 2556	Wire and Cable Test Methods
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
625	UL 2202	Electric Vehicle (EV) Charging System Equipment	
	-	UL 2231-1	Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits — Part 1: General Requirements
	-	UL 2231-2	Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits — Part 2: Particular Requirements for Protection Devices for Use in Charging Systems
	-	UL 2251	Plugs, Receptacles and Couplers for Electrical Vehicles
	-	UL 2580	Batteries for Use in Electric Vehicles
	-	UL 2594	Electric Vehicle Supply Equipment

Article	Standard Number	Standard Title	
	-	UL Subject 9741	Bidirectional Electric Vehicle (EV) Charging System Equipment
626	UL 62	Flexible Cords and Cables	
	-	UL 231	Power Outlets
	-	UL 498	Attachment Plugs and Receptacles
	-	UL 498D	Attachment Plugs, Cord Connectors and Receptacles with Arcuate (Locking Type) Contacts
	-	UL 498E	Attachment Plugs, Cord Connectors and Receptacles — Enclosure Types for Environmental Protection
	-	UL 498F	Plugs, Socket-Outlets and Couplers with Arcuate (Locking Type) Contacts
	-	UL 817	Cord Sets and Power-Supply Cords
	-	UL 1686	Pin and Sleeve Configurations
630	UL 551	Transformer-Type Arc-Welding Machines	
640	UL 13	Power Limited Circuit Cables	
	-	UL 62	Flexible Cords and Cables
	-	UL 813	Commercial Audio Equipment
	-	UL 1310	Class 2 Power Units
	-	UL 1419	Professional Video and Audio Equipment
	-	UL 1492	Audio-Video Products and Accessories
	-	UL 1711	Amplifiers for Fire Protective Signaling Systems
	-	UL 2269	Outline for Optical Fiber/Communications /Signaling/Coaxial Cable Outlet Boxes
	-	UL 6500	Audio/Video and Musical Instrument Apparatus for Household, Commercial, and Similar General Use
	-	UL 60065	Audio, Video and Similar Electronic Apparatus — Safety Requirements
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
645	UL 38	Manual Signaling Boxes for Fire Alarm Systems	
	-	UL 268	Smoke Detectors for Fire Alarm Systems

Article	Standard Number	Standard Title	
	-	UL 444	Communications Cables
	-	UL 464	Audible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories
	-	UL 497B	Protectors for Data Communications and Fire Alarm Circuits
	-	UL 833	Control Units and Accessories for Fire Alarm Systems -
	UL 864	Control Units and Accessories for Fire Alarm Systems	
	-	UL 1425	Cables for Power-Limited Fire-Alarm Circuits
	-	UL 1426	Cables for Non-Power-Limited Fire-Alarm Circuits
	-	UL 1449	Surge Protective Devices
	-	UL 1480	Speakers for Fire Alarm and Signaling Systems, Including Accessories
	-	UL 1638	Visible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories
	-	UL 1651	Optical Fiber Cable
	-	UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
	-	UL 1690	Data-Processing Cable
	-	UL 1778	Uninterruptible Power Systems
	-	UL 2024	Cable Routing Assemblies and Communications Raceways
	-	UL 60950-1	Information Technology Equipment Safety — Part 1: General Requirements
	-	UL 60950-21	Information Technology Equipment Safety — Part 21: Remote Power Feeding
	-	UL 60950-22	Information Technology Equipment Safety — Part 22: Equipment to be Installed Outdoors
	-	UL 60950-23	Information Technology Equipment Safety — Part 23: Large Data Storage Equipment
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
646	UL 10C	Positive Pressure Fire Tests of Door Assemblies	
	-	UL 62	Flexible Cords and Cables
	-	UL 67	Panelboards

Article	Standard Number	Standard Title	
	-	UL 98	Enclosed and Dead-Front Switches
	-	UL 305	Panic Hardware
	-	UL 347	Medium-Voltage AC Contactors, Controllers, and Control Centers
	-	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
	-	UL 508	Industrial Control Equipment
	-	UL 508A	Industrial Control Panels
	-	UL 845	Motor Control Centers
	-	UL 869A	Reference Standard for Service Equipment
	-	UL 891	Switchboards
	-	UL 891A	Switchboards Rated 601–1000 V
	-	UL 924	Emergency Lighting and Power Equipment
	-	UL 977	Fused Power-Circuit Devices
	-	UL 1008	Transfer Switch Equipment
	-	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
	-	UL 1008M	Meter-Mounted Transfer Switches
	-	UL 1008S	Solid-State Transfer Switches
	-	UL 1062	Unit Substations
	-	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	-	UL 1429	Pullout Switches
	-	UL 1449	Surge Protective Devices
	-	UL 1655	Community-Antenna Television Cables
	-	UL 1989	Standby Batteries
	-	UL Subject 2755	Modular Data Centers
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
647	UL 1598	Luminaires	
650	UL 1310	Class 2 Power Units	
	-	UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements

Article	Standard Number	Standard Title	
670	ANSI/CSA-C22.2 No. 19085-1	Woodworking machines — Safety — Part 1: Common requirements	
	-	UL 508	Industrial Control Equipment
	-	UL 61800-5-1	Adjustable Speed Electrical Power Drive Systems — Part 5-1: Safety Requirements — Electrical, Thermal and Energy
	-	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
	-	UL 489G	Outline for Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures, 650–1000 Volts AC and 650–1500 Volts DC
675	UL 493	Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables	
	-	UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords
680	UL 6	Electrical Rigid Metal Conduit — Steel	
	-	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	-	UL 20	General Use Snap-Switches
	-	UL 62	Flexible Cords and Cables
	-	UL 360	Liquid-Tight Flexible Metal Conduit
	-	UL 379	Power Units for Fountain, Swimming Pool, and Spa Luminaires
	-	UL 467	Grounding and Bonding Equipment
	-	UL 486D	Sealed Wire Connector Systems
	-	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	-	UL 676	Underwater Luminaires and Submersible Junction Boxes
	-	UL 676A	Potting Compounds for Swimming Pool, Fountain, and Spa Equipment
	-	UL 943	Ground-Fault Circuit-Interrupters
	-	UL 943C	Outline of Investigation for Special Purpose Ground-Fault Circuit-Interrupters
	-	UL 1004-10	Pool Pump Motors -

Article	Standard Number	Standard Title	
	UL ~~1060~~	~~Circuit Breaker and Ground Fault Circuit Interrupters~~	-
	-	UL 1241	Isolated Power Systems Equipment
	-	UL 1242	Electrical Intermediate Metal Conduit - Steel
	-	UL 1261	Electric Water Heaters for Pools and Tubs
	-	UL 1563	Electric Spas, Equipment Assemblies, and Associated Equipment
	-	UL 1569	Metal-Clad Cables
	-	UL 1660	Liquid-Tight Flexible Nonmetallic Conduit
	-	UL 1795	Hydromassage Bathtubs
	-	UL 2420	Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
	-	UL Subject 2452	Outline of Investigation for Electric Swimming Pool and Spa Cover Operators
	-	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
	-	UL 2515A	Supplemental Requirements for Extra Heavy Wall Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
	-	UL 2995	Lifts for Swimming Pools and Spas
	-	UL 60335-2-1000	Household and Similar Electrical Appliances: Particular Requirements for Electrically Powered Pool Lifts
682	UL 486D	Sealed Wire Connector Systems	
	-	UL 1650	Portable Power Cable
690	UL 98B	Enclosed and Dead-Front Switches for Use in Photovoltaic Systems	
	-	UL 248-19	Low-Voltage Fuses — Photovoltaic Fuses
	-	UL 467	Grounding and Bonding Equipment
	-	UL 489B	Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures for Use with Photovoltaic (PV) Systems
	-	UL Subject 508I	Manual Disconnect Switches Intended for Use in Photovoltaic Systems
	~~UL~~ 1081	Swimming Pool Pumps, Filters, and Chlorinators	

Article	Standard Number	Standard Title	
	-	UL 1569	Metal-Clad Cables
	-	UL 1699B	Photovoltaic DC Arc-Fault Circuit Protection
	-	UL 1703	Flat-Plate Photovoltaic Modules and Panels
	-	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources
	-	UL 2703	Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels
	-	UL 3001	Distributed Energy Generation and Storage Systems
	-	UL 3003	Distributed Generation Cables
	-	UL 3005	Distributed Energy Resource Management Systems
	-	UL Subject 3703	Solar Trackers
	-	UL Subject 3730	Photovoltaic Junction Boxes
	-	UL 3741	Photovoltaic Hazard Control
	-	UL 4703	Photovoltaic Wire
	-	UL 6703	Connectors for Use in Photovoltaic Systems
	-	UL Subject 6703A	Multi-Pole Connectors for Use in Photovoltaic Systems
	-	UL 7103	Outline for Investigation for Building-Integrated Photovoltaic Roof Coverings
	-	UL Subject 8703	Concentrator Photovoltaic Modules and Assemblies
	-	UL 8801	Outline for Photovoltaic-Powered Luminaire Systems
	-	UL Subject 9703	Distributed Wiring Harnesses
	-	UL 61730-1	Photovoltaic (PV) Module Safety Qualification — Part 1: Requirements for Construction
	-	UL 61730-2	Photovoltaic (PV) Module Safety Qualification — Part 2: Requirements for Testing
	-	UL 62109-1	Power Converters for Use in Photovoltaic Power Systems — Part 1: General Requirements
	-	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
693	-	-	
692	UL 2262	Outline for Fuel Cell Modules for Use in Portable and Stationary Equipment	

Article	Standard Number	Standard Title	
	-	UL 2262A	Outline for Borohydride Fuel Cartridges with Integral Fuel Processing for Use with Portable Fuel Cell Power Systems or Similar Equipment
	-	UL 2265	Fuel Cell Power Units and Fuel Storage Containers for Portable Devices
	-	UL 2265A	Outline for Hand-held or Hand-Transportable Fuel Cell Power Units with Disposable Methanol Fuel Cartridges for use in Original Equipment Manufacturer's Information Technology Equipment
	-	UL 2265C	Outline for Hand-Held or Hand-Transportable Alkaline (Direct Borohydride) Fuel Cell Power Units and Borohydride Fuel Cartridges For Use With Consumer Electronics or Information Technology Equipment
	-	UL 2266	Electromagnetic Compatibility, Electrical Safety, and Physical Protection of Stationary and Portable Fuel Cell Power Systems for Use with Commercial Network Telecommunications Equipment
	-	UL 2267	Fuel Cell Power Systems for Installation in Industrial Electric Trucks
-	-	-	
694	UL 467	Grounding and Bonding Equipment	
	-	UL Subject 489C	Molded-Case Circuit Breakers and Molded-Case Switches for Use with Wind Turbines
	-	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources
	-	UL 2227	Outline for Flexible Motor Supply Cable and Wind Turbine Tray Cable
	-	UL 2736	Outline for Single Pole Separable Interconnecting Cable Connectors for Use with Wind Turbine Generating Systems
	-	UL 4143	Wind Turbine Generator - Life Time Extension (LTE)
	-	UL 6141	Wind Turbines Permitting Entry of Personnel

Article	Standard Number	Standard Title	
	-	UL 6142	Wind Turbine Generating Systems — Small
	-	UL 6171	Wind Turbine Converters and Interconnection Systems Equipment
695	UL 6	Electrical Rigid Metal Conduit — Steel	
	-	UL 6A	Electrical Rigid Metal Conduit — Aluminum, Red Brass and Stainless Steel
	-	UL 218	Fire Pump Controllers
	-	UL 448	Centrifugal Stationary Pumps for Fire-Protection Service
	-	UL 448B	Residential Fire Pumps Intended for One- and Two-Family Dwellings and Manufactured Homes
	-	UL 448C	Stationary, Rotary-Type, Positive-Displacement Pumps for Fire Protection Service
	-	UL 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
	-	UL 1004-5	Fire Pump Motors
	-	UL 1242	Electrical Intermediate Metal Conduit — Steel
	-	UL 1569	Metal-Clad Cables
	-	UL 1724	Outline for Fire Tests for Electrical Circuit Protective Systems
	-	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
	-	UL 2515	Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
696	-	-	
700	UL 924	Emergency Lighting and Power Equipment	
	-	UL 1008	Transfer Switch Equipment
	-	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
	-	UL 1449	Surge Protective Devices
	-	UL 1724	Outline for Fire Tests for Electrical Circuit Protective Systems
	-	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
	-	UL 2200	Stationary Engine Generator Assemblies

Article	Standard Number	Standard Title	
701	UL 924	Emergency Lighting and Power Equipment	
	-	UL 1008	Transfer Switch Equipment
	-	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
702	UL 1008	Transfer Switch Equipment	
703	-	-	
	-	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
	-	UL 1008M	Meter-Mounted Transfer Switches
	-	UL 1008S	Solid-State Transfer Switches
705	UL 62	Flexible Cords and Cables	
	-	UL 486D	Sealed Wire Connector Systems
	-	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
	-	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	-	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources
	-	UL 2200	Stationary Engine Generator Assemblies
	-	UL 3003	Outline for Distributed Generation Cables
	-	UL 6142	Small Wind Turbine Systems
	-	UL 6171	Wind Turbine Converters and Interconnection Systems Equipment
	-	UL 9540	Energy Storage Systems and Equipment
	-	UL 62109-2	Power Converters for Use in Photovoltaic Power Systems — Part 2: Particular Requirements for Inverters
706	UL 248-2	Low-Voltage Fuses — Part 2: Class C Fuses	
	-	UL 248-3	Low-Voltage Fuses — Part 3: Class CA and CB Fuses
	-	UL 248-4	Low-Voltage Fuses — Part 4: Class CC Fuses
	-	UL 248-5	Low-Voltage Fuses — Part 5: Class G Fuses
	-	UL 248-6	Low-Voltage Fuses — Part 6: Class H Non-Renewable Fuses
	-	UL 248-8	Low-Voltage Fuses — Part 8: Class J Fuses

Article	Standard Number	Standard Title	
	-	UL 248-9	Low-Voltage Fuses — Part 9: Class K Fuses
	-	UL 248-12	Low-Voltage Fuses — Part 12: Class R Fuses
	-	UL 248-15	Low-Voltage Fuses — Part 15: Class T Fuses
	-	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
	-	UL 489H	Outline for Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures, for Use with Direct Current (DC) Microgrids
	-	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	-	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources
	-	UL 9540	Energy Storage Systems and Equipment
708	UL 1	Flexible Metal Conduit	
	-	UL 4	Armored Cable
	-	UL 83	Thermoplastic-Insulated Wires and Cables
	-	UL 360	Liquid-Tight Flexible Metal Conduit
	-	UL 493	Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables
	-	UL 497A	Secondary Protectors for Communications Circuits
	-	UL 1008	Transfer Switch Equipment
	-	UL 1008A	Transfer Switch Equipment, Over 1000 Volts
	-	UL 1008M	Meter-Mounted Transfer Switches
	-	UL 1008S	Solid-State Transfer Switches
	-	UL 1569	Metal-Clad Cables
	-	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
710	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources	
712	UL 248-2	Low-Voltage Fuses — Part 2: Class C Fuses	

Article	Standard Number	Standard Title	
	-	UL 248-3	Low-Voltage Fuses — Part 3: Class CA and CB Fuses
	-	UL 248-4	Low-Voltage Fuses — Part 4: Class CC Fuses
	-	UL 248-5	Low-Voltage Fuses — Part 5: Class G Fuses
	-	UL 248-6	Low-Voltage Fuses — Part 6: Class H Non-Renewable Fuses
	-	UL 248-8	Low-Voltage Fuses — Part 8: Class J Fuses
	-	UL 248-9	Low-Voltage Fuses — Part 9: Class K Fuses
	-	UL 248-12	Low-Voltage Fuses — Part 12: Class R Fuses
	-	UL 248-15	Low-Voltage Fuses — Part 15: Class T Fuses
	-	UL 498G	Outline for Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures, for Use with Direct Current (DC) Microgrids
	-	UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
	-	UL 1670	Medium Voltage Circuit Breakers and Metal-Clad Switchgear
	-	UL 1671	Medium Voltage Metal-Clad Switchgear
	-	UL 1741	Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources
	-	UL 6142	Small Wind Turbine Systems
	-	UL 6171	Wind Turbine Converters and Interconnection Systems Equipment
	-	UL 9540	Energy Storage Systems and Equipment
	-	UL 60947-1	Low-Voltage Switchgear and Controlgear — Part 1: General Rules
	-	UL 60947-4-1	Low-Voltage Switchgear and Controlgear — Part 4-1: Contactors and Motor-Starters — Electromechanical Contactors and Motor-Starters
	-	UL 62109-2	Power Converters for Use in Photovoltaic Power Systems — Part 2: Particular Requirements for Inverters
725	UL 13	Power-Limited Circuit Cables	
	-	UL 444	Communications Cable

Article	Standard Number	Standard Title	
	-	UL 1012	Power Units Other Than Class 2
	-	UL 1277	Electrical Power and Control Tray Cables with Optional Optical-Fiber Members
	-	UL 1310	Class 2 Power Units
	-	UL 1666	Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts
	-	UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
	-	UL 2196	Fire Test for Circuit Integrity of Fire -Resistive Power, Instrumentation, Control and Data Cables
	-	UL 5085-3	Low Voltage Transformers — Part 3: Class 2 and Class 3 Transformers
	-	UL Subject 9990	Information and Communication Technology (ICT) Power Cables
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
727	UL 2250	Instrumentation Tray Cable	
728	UL 5	Surface Metal Raceways and Fittings	
	-	UL 5A	Nonmetallic Surface Raceways and Fittings
	-	UL 5B	Strut-Type Channel Raceways and Fittings
	-	UL 5C	Surface Raceways and Fittings for Use with Data, Signal, and Control Circuits
	-	UL 209	Cellular Metal Floor Raceways and Fittings
	-	UL 467	Grounding and Bonding Equipment
	-	UL 514A	Metallic Outlet Boxes
	-	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	-	UL 568	Nonmetallic Cable Tray Systems
	-	UL 884	Underfloor Raceways and Fittings
	-	UL Subject 1724	Fire Tests for Electrical Circuit Protective Systems
	-	UL 2024	Cable Routing Assemblies and Communications Raceways

Article	Standard Number	Standard Title	
	-	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
760	UL 268	Smoke Detectors for Fire Alarm Signaling Systems	
	-	UL 268A	Smoke Detectors for Duct Application
	-	UL 486C	Splicing Wire Connectors
	-	UL 497B	Protectors for Data Communication and Fire Alarm Circuits
	-	UL 1424	Cables for Power-Limited Fire-Alarm Circuits
	-	UL 1425	Cables for Non–Power-Limited Fire-Alarm Circuits
	-	UL 1480	Speakers for Fire Alarm and Signaling Systems, Including Accessories
	-	UL 1666	Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts
	-	UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
	-	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
770	UL 467	Grounding and Bonding Equipment	
	-	UL 568	Nonmetallic Cable Tray Systems
	-	UL 1651	Optical Fiber Cable
	-	UL 2024	Optical Fiber and Communication Cable Raceway
	-	UL 2196	Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables
	-	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
800	UL 444	Communications Cables	
	-	UL 467	Grounding and Bonding Equipment
	-	UL 489A	Circuit Breakers for Use in Communication Equipment
	-	UL 497	Protectors for Paired-Conductor Communications Circuits

Article	Standard Number	Standard Title	
	-	UL 497A	Secondary Protectors for Communications Circuits
	-	UL 497C	Protectors for Coaxial Communications Circuits
	-	UL Subject 497E	Protectors for Antenna Lead-In Conductors
	-	UL Subject 523	Telephone Service Drop Wire
	-	UL 568	Nonmetallic Cable Tray Systems
	-	UL 723	Test for Surface Burning Characteristics of Building Materials
	-	UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords
	-	UL 1666	Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts
	-	UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
	-	UL 1863	Communication Circuit Accessories
	-	UL 2024	Cable Routing Assemblies and Communications Raceways
	-	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
805	UL 444	Communications Cables	
	-	UL 497	Protectors for Paired-Conductor Communications Circuits
	-	UL 497A	Secondary Protectors for Communications Circuits
	-	UL 497C	Protectors for Coaxial Communications Circuits
	-	UL Subject 497E	Protectors for Antenna Lead-In Conductors
	-	UL Subject 523	Telephone Service Drop Wire
	-	UL 719	Nonmetallic-Sheathed Cables
	-	UL 1310	Class 2 Power Units
	-	UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords
	-	UL 1685	Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
	-	UL 1863	Communication Circuit Accessories

Article	Standard Number	Standard Title	
	-	UL 2043	Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces
	-	UL 62275	Cable Management Systems — Cable Ties for Electrical Installation
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
810	UL 150	Antenna Rotators	
	-	UL 452	Antenna-Discharge Units
	-	UL 467	Grounding and Bonding Equipment
	-	UL Subject 497E	Protectors for Antenna Lead-In Conductors
820	UL 444	Communications Cables	
	-	UL Subject 497E	Protectors for Antenna Lead-In Conductors
	-	UL 1655	Community-Antenna Television Cables
830	UL 444	Communications Cables	
	-	UL 497A	Secondary Protectors for Communications Circuits
	-	UL 497C	Protectors for Coaxial Communications Circuits
	-	UL Subject 497E	Protectors for Antenna Lead-In Conductors
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
840	UL 444	Communications Cables	
	-	UL 467	Grounding and Bonding Equipment
	-	UL 498A	Current Taps and Adapters
	-	UL 1310	Class 2 Power Units
	-	UL 1651	Optical Fiber Cable
	-	UL 1863	Communication Circuit Accessories
	-	UL 2024	Cable Routing Assemblies and Communications Raceways
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
Tables 11(A) and 11(B)	UL 1310	Class 2 Power Units	
	-	UL 1434	Thermistor-Type Devices

Article	Standard Number	Standard Title	
	-	UL 5085-3	Class 2 and Class 3 Transformers
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements
Tables 12(A) and 12(B)	UL 1310	Class 2 Power Units	
	-	UL 1434	Thermistor-Type Devices
	-	UL 5085-3	Class 2 and Class 3 Transformers
	-	UL 62368-1	Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements

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.

For Article 680 in the table for this annex, this change modifies the title of UL 943C to reflect the actual title of the stndard and removes the UL standard 1060 as that standard does not exist.

Related Item

• FR 8406

Submitter Information Verification

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Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-7541-NFPA 70-2021
Statement: The annex is revised to reference current safety standards. Part 2 has been added to address product safety standards for conductors and equipment that do not have an associated listing requirement

Public Comment No. 1630-NFPA 70-2021 [Annex K]

Informative Annex K Use of Medical Electrical Equipment in Dwellings and Residential Board-and-Care Occupancies

~~In recent years there has been a significant increase in home or remote patient use of electrical dependent medical equipment, and it is widely considered that this trend will continue in the coming years. Because of this trend, an investigation of the appropriate interaction of this critical equipment with *NFPA 70* , *National Electrical Code (NEC)* installations, both existing and new, should occur.~~

Medical electrical equipment (MEE) is equipment that has an applied part that transfers or detects energy to and from a patient. This equipment is provided with a single connection to electrical power and is intended ~~for use~~ by the manufacturer ~~, either by marking on equipment or in instructions,~~ to be used for diagnosis, treatment, or monitoring of a patient or for compensation or alleviation of disease, injury, or disability. The environment for intended use can be best described as a place where the patient lives or is present without continuous supervision or aid by professional workers. The Social Security Administration for Medicare provides a definition for durable medical equipment (DME) that is broader than electrical: equipment that is primarily used to serve a medical purpose and is appropriate for use in the home.

MEE ~~is generally divided into classes relating to means of protection (MOP). With Class I equipment, protection against electric shock relies on protective earth. Class II equipment does not rely on protective earth as an MOP but instead relies on double or reinforced insulation as an MOP against electric shock. Class II equipment does not have provisions for protective earth or reliance upon installation conditions. For home use MEE, Class I equipment includes a grounding connection and must be permanently installed.MEE~~ evaluated for compliance with the ES 60601-1 series of standards are typically Class II equipment unless they are permanently connected to the building power. While there are varying applications and intended uses of medical equipment, one of the most critical is life support medical equipment. This equipment is intended to actively keep alive or resuscitate a patient. Due to the critical intent of this equipment, interaction with an *NEC* installation is critical. Reliable supply of power and understanding of availability of electrical power should there be an outage are key parameters to consider. This type of medical equipment is often supplied with backup power appropriate for the intended use and critical nature of its function. Life support equipment should be on a circuit with limited or no other loads to prevent overloading and unintended removal of power. It is recommended to supply this equipment with an individual branch circuit. If this is not a feasible option due to current installation conditions, it is recommended to conduct the following analysis and labeling:

(1) Conduct an analysis of the circuit intended to supply the life support equipment including all lighting or other outlets that are on the circuit.

(2) ~~Follow the rules of 210.16 limiting MEE~~ Limit MEE loads on this circuit to 50 percent or less.

(3) Determine that adequate loading is available for the reliable supply of power to the life support equipment.

(4) Conduct an analysis around the need for backup power given the availability of the patient to access an alternate supply source should they lose primary power in the intended location of the equipment. This will be affected by the distance to next available option for electrical power, the mobility of the patient, or access to others able to assist. If there is a concern in this area, then backup power at the primary location is suggested.

(5) In the absence of an alarm integral to the MEE, an audible alarm should be provided that monitors the circuit supplying power to the equipment and sets off an alarm when power is lost at the outlet supplying the MEE.

(6) Investigate electrical devices and components in the premises wiring system to ensure that remote control or switching are not allowed. ~~Verify the overcurrent protective device(s) and other fault detection devices do not operate.~~ Confirm continuity of power by energizing equipment, and run through a normal cycle of functions to ensure reliable supply of power.

(7) Label all receptacles available to supply power to other loads on the circuit. The labeling should read as follows or similar language with the same intent:

WARNING — Power loss risk to

life-support and medical equipment on same circuit.

DO NOT OVERLOAD

When using medical equipment, it is critical to understand the conditions and environment in which it will be used. Locating the equipment in wet or damp locations or near other systems (e.g., water, gas, oxygen, sparks) can present hazards that need to be addressed in the installation. For wet and damp locations, MEE will be marked for use in these locations with an ingress protection IPXX (e.g., IP22) rating on the equipment. In the absence of IP21 or higher markings, the equipment should not be used

in wet or damp locations. If the equipment is marked with an Umbrella (Keep Dry) symbol, it is limited to dry locations only.

Statement of Problem and Substantiation for Public Comment

The jargon of “widely considered” lacks any citation. Considered by who, and in which peer-reviewed scientific or medical journal can I find that opinion? The entire first paragraph is not necessary, and it if is necessary a reputable source should be cited.
The language about “intended for use by the manufacturer” is confusing, as it implies that the manufacturer of the equipment is also the user.
The language about “protective earth” goes against every effort made in Article 250 and the rest of the Code for the last 20 years. The earth has no role in providing safety from electric shock at the voltages present in dwelling units.
If the recommendation is just to limit the load to 50% or less, why am I referencing 210.16? It doesn't seem needed, and if 210.16 is added I'm sure it won't be an optional section anyway.
The sentence about verifying overcurrent devices do not function should be deleted. If I verify that an overcurrent device does not operate I need to throw that overcurrent device in the garbage.

Related Item

• PI 3607

Submitter Information Verification

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Submittal Date: Mon Aug 16 17:33:59 EDT 2021
Committee: NEC-P01

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-7543-NFPA 70-2021 The first paragraph was retained to provide information on the development and application of Informative Annex K.

Statement: The phrase “protective earth” has been corrected reflect the requirements of 250.4. The reference to 210.16 in list item #2 is changed to 210.23(B)(2) for 50% branch circuit rating. The wording in list item #6 to “verify the overcurrent protective device(s) and other fault detection devices do not operate” is deleted as accomplishing this in practice would be impracticable.