Code-Making Panel 1
Public Input Report (A19)

Public Input No. 1781-NFPA 70-2017 [Global Input]

Type your content here ...Change "Physical Damage" to "Mechanical Damage"

Statement of Problem and Substantiation for Public Input

The term, "Physical damage" is not defined in Article 100, though it is used widely in the NEC. Therefore, in accordance with the Style Manual's Section 2.2.2.1 and Section 3.3.4, it should be interpreted in accordance with the standard dictionary definition rather than an "industry-specific term" or "trade terminology." The standard dictionary definition does not exclude temperature, chemicals, and other potential sources of harm. These are clearly not intended in many of the places where the term.appears, based on the requirements listed in those places for equipment subject to physical damage or severe physical damage. Mechanics is a dictionary term commonly understood to refer to the sort of forces our trade terminology has referred to by the term, "physical," to the extent that the Style Manual, in Section 3.2.55 recommends its use despite the apparent conflict with Section 3.3.4 "Mechanical damage" is used elsewhere in NP standards where the NEC uses "Physical damage."

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Public Input No. 1342-NFPA 70-2017 [Global Input]

Type your content here ...Replace "listed and identified" with "listed" in all locations

Statement of Problem and Substantiation for Public Input

The use of the words "and identified" following the word "listed" is redundant and adds confusion to the NEC. If the equipment is listed, it is already "identified" based on the definition of "identified" and the informational note that follows that definition. The use of the term "listed and identified" would permit the use of a product that is not listed for the purpose to be used where the local inspection authority had "identified" that the product is suitable for the purpose. It appears to me that everywhere the code uses the term "listed" that the intent is that the product be listed for the purpose.

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Submittal Date: Wed Jul 26 20:35:32 EDT 2017

Public Input No. 1045-NFPA 70-2017 [Global Input]

Revise the issue date of ANSI/IEEE C2-2012, *National Electrical Safety Code*, from 2012 to 2017.

Statement of Problem and Substantiation for Public Input

The National Electrical Safety Code is referenced in numerous places in the NEC. The latest edition is the 2017 edition.

Submitter Information Verification

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Public Input No. 3453-NFPA 70-2017 [Global Input]

Remove the phrase “the provisions of” throughout the entire NEC and editorial revise each segment of text as required.

Statement of Problem and Substantiation for Public Input

The phrase is unnecessary and redundant. This global public input seeks to request that each NEC Panel (technical committee) review the articles under their responsibility and remove this phrase and reword the text accordingly. The requirements are already provided in the NEC so it does not make sense to refer to provisions. In many cases the phrase should refer to a section, then state that section in accordance with the NEC Style Manual requirements.

Substantiation Examples:

90.6 Formal Interpretations. To promote uniformity of interpretation and application of the provisions of this Code, formal interpretation procedures have been established and are found
in the NFPA Regulations Governing Committee Projects.

110.3(A)Examination, Identification, Installation, Use, and Listing (Product Certification) of Equipment.
(1) Suitability for installation and use in conformity with the provisions of this Code

110.30 General. Conductors and equipment used on circuits over 1000 volts, nominal, shall comply with Part I of this article and with 110.30 through 110.41 , which supplement or modify
Part I. In no case shall the provisions of this part apply to equipment on the supply side of the service point.

110.51 General.

(A)Covered. The provisions of this p Part IV shall apply to the installation and use of high-voltage power distribution and utilization equipment that is portable, mobile, or both, such as substations, trailers, cars, mobile shovels, draglines, hoists, drills, dredges, compressors, pumps, conveyors, underground excavators, and the like.

210.13 Ground-Fault Protection of Equipment. Each branch circuit disconnect rated 1000 A or more and installed on solidly grounded wye electrical systems of more than 150 volts to ground, but not exceeding 600 volts phase-to-phase, shall be provided with ground-fault protection of equipment in accordance with the provisions of 230.95.

Exception No. 1: The provisions of this This section shall not apply to a disconnecting means for a continuous industrial process where a nonorderly shutdown will introduce additional or increased hazards.
Exception No. 2: The provisions of this This section shall not apply if ground-fault protection of equipment is provided on the supply side of the branch circuit and on the load side of any transformer supplying the branch circuit.

Section 210.60(B)

(B) Receptacle Placement. In applying the provisions of 210.52(A), the total number of receptacle outlets shall not be less than the minimum number that would comply with the
provisions of that section. These receptacle outlets shall be permitted to be located conveniently for permanent furniture layout. At least two receptacle outlets shall be readily accessible. Where receptacles are installed behind the bed, the receptacle shall be located to prevent the bed from contacting any attachment plug that may be installed or the receptacle shall be provided with a suitable guard.

Submitter Information Verification

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Public Input No. 4317-NFPA 70-2017 [Global Input]

Each code making panel should set time aside to review the requirements under their purview to ensure that new and existing requirements are in compliance with the NEC style manual.

Statement of Problem and Substantiation for Public Input

Code making panels are responsible for ensuring that the Code text which agreed upon at the technical panel meetings comply with all requirements of the NEC style manual. It would be prudent for each code making panel to set time aside to review the requirements under their purview to ensure that not only new but existing requirements are in compliance with the requirements of the NEC style manual.

Adherence to the NEC style manual promotes consistency throughout the NEC adding to clarity to the users of the NEC. Code making panels should spend available time reviewing for such important style manual requirements as the following: (These are just some examples and not a comprehensive list of style manual requirements.)

Unenforceable Terms. The NEC shall not contain references or requirements that are unenforceable or vague. The terms contained in Table 3.2.1 of the style manual shall be reviewed in context, and, addressed if the resulting requirement is unenforceable or vague. Examples of unenforceable and Vague Terms include the following:

designed for the purpose.
good
adequate
frequent(ly)

Writing in present text. Requirements must be written in present text and not future text. A good example of this is as follows:

Correct: No conductor shall be used in such a manner that its operating temperature exceeds that designated for the type of insulated conductor involved.
Incorrect: No conductor shall be used in such a manner that its operating temperature will exceed that designated for the type of insulated conductor involved.

Submitter Information Verification

Submitter Full Name: Thomas Domitrovich
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Public Input No. 777-NFPA 70-2017 [Global Input]

The terms “satisfactory” - "equal" - "equivalent", etc., are examples of numerous subjective terms found in the NEC where decisions of suitability fall under the purview of the AHJ. Changing or supplementing these terms to "approved" - "approved equivalent" will continue the alignment of language used throughout the NEC.

I authored a couple of such changes for the 2014 NEC that were adopted in the 2017. It was suggested to me by someone from NFPA that I submit a global input, so a committee would be appointed to locate and revise all such subjective terms to include the word "approved".

This will reduce the number of terms used to determine suitability of equipment as it applies to installation/inspection to one of the following: "Listed" - "Identified" - "Approved"

Statement of Problem and Substantiation for Public Input

I think the language in my global proposal not only states the problem, but offers a viable solution to facilitate uniformity of language throughout the NEC.

Submitter Information Verification

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Public Input No. 1234-NFPA 70-2017 [Section No. 90.1(B)]

(B) Adequacy.

This *Code* contains provisions that are considered necessary for safety. Compliance therewith, periodic inspections thereafter, and proper maintenance result in an installation that is essentially free from hazard but not necessarily efficient, convenient, or adequate for good service or future expansion of electrical use.

Informational Note: Hazards often occur because of overloading of wiring systems by methods or usage not in conformity with this *Code*. This occurs because initial wiring did not provide for increases in the use of electricity. An initial adequate installation and reasonable provisions for system changes provide for future increases in the use of electricity.

Statement of Problem and Substantiation for Public Input

Harsh environmental conditions; hard use of some equipment and installations; and limited lifespan of some equipment result in less safe or unsafe conditions for some equipment and installations. Proposed text does not reflect a specific time frame or specific installations since those can vary widely across the country or globe where the NEC is adopted or used. However, proposed text informs and allows local governing authorities the ability to institute ongoing inspections in a reasonable manner when needed. Many electrical installations, where installed in a compliant manner, are clearly able to operate for years and decades with normal maintenance. However, periodic inspection or review is clearly needed for other installations. Examples include, but are not limited to batteries in emergency unit equipment, operation of emergency generators, operation of transfer equipment, operation of fire pumps and associated equipment, and the wiring and equipment at swimming pools, marinas, and other installations around bodies of water. That harsh environment clearly limits the safe life of the electrical installation. The time fame for periodic inspection might be supplemented by some documented maintenance program, but those details should likely be developed at the local level based on local conditions.

Submitter Information Verification

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Public Input No. 1245-NFPA 70-2017 [New Section after 90.1(C)]

90.1 (D) Listing and Certification

This is an international code adopted by many countries, the listing requirement referenced in this code shall be accorden to the country standard in which the product is being installed.

Statement of Problem and Substantiation for Public Input

Here in the US when the code states a listing requirement, it should be clear it is for a US standard not European or Canada. the code states the need of a listing nothing says it has to be one that is recognized for the country it is being installed in.

Submitter Information Verification

Submitter Full Name: Alfio Torrisi
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Copyright Assignment

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Public Input No. 1101-NFPA 70-2017 [Section No. 90.2(A)]

(A) Covered.

This *Code* covers the installation ~~and~~ , use, and removal of electrical conductors, equipment, and raceways; signaling and communications conductors, equipment, and raceways; and optical fiber cables and raceways for the following:

(1) Public and private premises, including buildings, structures, mobile homes, recreational vehicles, and floating buildings

(2) Yards, lots, parking lots, carnivals, and industrial substations

(3) Installations of conductors and equipment that connect to the supply of electricity

(4) Installations used by the electric utility, such as office buildings, warehouses, garages, machine shops, and recreational buildings, that are not an integral part of a generating plant, substation, or control center

Statement of Problem and Substantiation for Public Input

In reality, the NEC contains many rules that we could argue are not really "installation" rules. The precedent has already been set by the NEC. For example, 590.6(A)(3) is in regards to generator design. 422.41 is in regards to appliance design. 590.5 is a requirement that my Christmas lights be listed. 406.7(A) is for construction of attachment plugs and cord connectors. 422.41 is more appliance design rules. 445.11 has requirements for manufacturer nameplate markings including portable generators. 600.10 contains requirements for portable or mobile signs. 400.12 sets limits for USES of extension cords (cord sets). None of these rules are truly "installation" rules. 394.12 prohibits concealed-knob-and-tube wiring from being USED in certain locations. 422.1 specifies that the article applies to appliances USED in any occupancy. 110.26(B) tells us that working space shall not be USED for storage. 240.83 contains rules for circuit breakers USED as switches. 250.50 requires certain electrodes to be installed and USED. 376.23(B) has requirements for wireways USED as pull boxes. 700.12(A) tells us that automotive-type batteries cannot be USED for emergency power.There are many other instances of equipment or conductors being restricted or required to be USED a certain way versus being INSTALLED a certain way. Do we just ignore these rules since they are really not part of the scope of the NEC as written? Or do we agree that these should become part of the NEC once they are connected or plugged in and being "used"? Some people would not consider a freestanding appliance or a self-contained spa/hotub plugged into a receptacle an "installation" and thus would not be covered under the scope of the NEC. I believe they absolutely SHOULD be within the scope of the NEC once they are "using" electricity. This is after all the very first rule in the code...90.1(A) Practical Safeguarding. The purpose of this code is the practical safeguarding of persons and property from hazards arising from the USE of electricity! This revision will align the NEC purpose and scope, and clarify rules for "using" electricity, conductors and equipment when the rules are not specifically written for "installations".

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Public Input No. 153-NFPA 70-2017 [Section No. 90.2(A)]

(A) Covered.

This *Code* covers the installation

and removal

of electrical conductors, equipment, and raceways; signaling and communications conductors, equipment, and raceways; and optical fiber cables and raceways for the following:

(1) Public and private premises, including buildings, structures, mobile homes, recreational vehicles, and floating buildings

(2) Yards, lots, parking lots, carnivals, and industrial substations

(3) Installations of conductors and equipment that connect to the supply of electricity

(4) Installations used by the electric utility, such as office buildings, warehouses, garages, machine shops, and recreational buildings, that are not an integral part of a generating plant, substation, or control center

(5) Installations used by the electric utiliy and under the utiliys exclusive control that are isolated within the customers premiss wiring (system)

Statement of Problem and Substantiation for Public Input

Where utility equipment, under the utility's exclusive control is installed beyond the service point (line of demarcation) and isolated within the premises wiring (system). The equipment must follow the NEC, It is now common practice to see a CT cabinet installed on a PV system for the utility's own metering purpose within the customers premise wiring system this type of utility installation relies on the neutral to bond the metallic parts of the system, if left to the utility this condition would create a violation of 250.24 (A) (5) and 250.6. separation of the neutral and EGC is essential for a hazardous free installation.Transformer are also commonly install for customer owned med/high voltage systems where the utility rents the transformer to the customer and holds the service contract for the equipment. This type of installation should also fall under the NEC

Submitter Information Verification

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Public Input No. 2442-NFPA 70-2017 [Section No. 90.2(A)]

(A) Covered.

This *Code* covers the installation and removal of electrical conductors, equipment, and raceways; signaling and communications conductors, equipment, and raceways; and optical fiber cables and raceways for the following:

(1) Public and private premises, including buildings, structures, mobile homes, recreational vehicles, and floating buildings

(2) Yards, lots, parking lots, carnivals, and industrial substations

(3) Installations of conductors and equipment that connect to the supply of electricity

(4) Installations used by the electric utility, such as office buildings, warehouses, garages, machine shops, and recreational buildings, that are not an integral part of a generating plant, substation, or control center

(5) Systems used to export electric power from vehicles, including outlets mounted on the vehicle.

Statement of Problem and Substantiation for Public Input

Providing AC power sources from automotive vehicles is increasingly common, for electrical, fuel cell, and even conventional vehicles. During power export from a vehicle, the power can be delivered to the grid (V2G), to a premise (V2P), or to a load (V2L). In most cases, off board equipment is used to control a portion of the process. However, the actual power source (vehicle battery), the available fault current from this source, and the protection/limiting components for this source are all vehicle components that are unknown to the user of the off board equipment. Further, as the vehicle electrical system design is not consistent between different vehicle makes or different vehicle models, there can be wide variations in available fault currents and circuit protection. For this reason, 625.48 already indicates that interactive off board equipment must be evaluated for use with the specific electric vehicles that is intended to be used with.

It is necessary for the Code to take a more proactive approach toward addressing safety of these electrical systems. This would include receptacles provided within vehicles for powering off board utilization equipment. Safety of receptacles located in a garage of a residential home are addressed by many rules in the Code , however, if this same type of receptacle is located in the vehicle, then there are presently no rules. This is a significant gap in the scope of the Code as equipment that Code is intending to protect through proper installation may no longer be protected in the same manner.

Vehicle systems, including receptacles, associated with power export all have related potential hazards associated with these installations, such as cut and abraded wire and cable, standing water and wet locations, and similar hazardous applications. The potential hazards could further be expanded to include damage from collisions or corrosion on the vehicle. These factors are why additional protection for personnel were included for EVs; however, as we see vehicles move from a load to a source, the same types of protection should be provided.

Code Making Panel 1 has already clearly affirmed in the 2014 Code that portable generators are absolutely in the scope of the NEC. If vehicles are being used as a specialized form of portable generators, they also should be explicitly addressed. The exclusion that had been in place in 90.2(B)(1), originally written to exclude electrical systems of conventional vehicles used only for powering the vehicle's inherent electrical system, needs to be updated and clarified to address the increasing use of vehicles as AC power supplies.

This is a companion proposal to other proposals in Article 625 to address this concern.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2443-NFPA 70-2017 [Section No. 625.1]	Related to addition of EVPE
Public Input No. 2444-NFPA 70-2017 [New Definition after Definition: Electric Vehicle Storage B...]	Related to addition of EVPE
Public Input No. 2445-NFPA 70-2017 [Definition: Electric Vehicle Supply Equipment.]	Related to addition of EVPE

Public Input No. 2446-NFPA 70-2017 [Section No. 625.5]	Related to addition of EVPE
Public Input No. 2448-NFPA 70-2017 [Section No. 625.16]	Related to addition of EVPE
Public Input No. 2449-NFPA 70-2017 [New Section after 625.40]	Related to addition of EVPE
Public Input No. 2452-NFPA 70-2017 [Section No. 625.41]	Related to addition of EVPE
Public Input No. 2454-NFPA 70-2017 [Section No. 625.43]	Related to addition of EVPE
Public Input No. 2455-NFPA 70-2017 [Section No. 625.44]	Related to addition of EVPE
Public Input No. 2456-NFPA 70-2017 [Section No. 625.48]	Related to addition of EVPE
Public Input No. 2458-NFPA 70-2017 [Article 625]	Related to addition of EVPE

Submitter Information Verification

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Submittal Date: Fri Aug 18 11:47:10 EDT 2017

Public Input No. 2560-NFPA 70-2017 [Section No. 90.2(A)]

(A) Covered.

This *Code* covers the installation and removal of electrical conductors, equipment, and raceways; signaling and communications conductors, equipment, and raceways; and optical fiber cables and raceways for the following:

(1) Public and private premises, including buildings, structures, mobile homes, recreational vehicles, and floating buildings

(2) Yards, lots, parking lots, carnivals, and industrial substations

(3) Installations of conductors and equipment that connect to the supply of electricity

(4) Installations used by the electric utility, such as office buildings, warehouses, garages, machine shops, and recreational buildings, that are not an integral part of a generating plant, substation, or control center

(5) Installations supplying shore power to ships and watercraft including monitoring of leakage current. This code shall determine minimum specifications for supplying shore power to ships and watercraft

Statement of Problem and Substantiation for Public Input

This public input is written to address potential hazards created where shore power is supplied to ships and watercraft. There have been a significant number of fatalities from drowning associated with leakage current from watercraft connected to shore power. The amount of current in the water renders a person incapable of self-preservation and the result is drowning. There are far too many fatalities occurring due to watercraft connected to shore power with significant levels of leakage current creating extremely hazardous conditions.

This public input attempts to clarify that the NEC has purview over the hazards created when watercraft is connected to shore power. The purpose of the NEC is the practical safeguarding of persons and property from hazards arising from the use of electricity. As the NEC technical committees attempt to address these hazards they are handcuffed by purview. Section 90.2(B) clearly eliminates installations in ships and watercraft from the purview of this code. Why? There are other NFPA codes/standards that have purview. Section 90.7 in a similar manner eliminates factory installed wiring from the purview of this code. Why? There are product standards that have purview. If products in the marketplace were creating similar serious safety concerns and fatalities were occurring, the NEC would immediately take action with requirements to eliminate the hazards. We cannot ignore such a significant gap in scope. The fatalities keep occurring. We must take practical, feasible steps to safeguard people from these hazards. The NEC must take action to control hazards that are created where watercraft is supplied by shore power. We need a requirement that denies supplying shore power to watercraft when that boat is creating the potential to kill. Only the NEC can get that done.

It is understood that an electrical installation on a marina or pier can create the same hazards. There is a big difference here. The NEC has purview over those installations and it is likely that we will see modifications this cycle to those requirements.

A favorable action on this public input will trigger immediate reaction from NFPA. This would certainly get the attention of NFPA Standards Council as they determine scope issues between competing codes and standards. If CMP-1 does not take a favorable action on this public input, the deadly gap in scope will remain. It is the right thing to do. If Standards Council tells the NEC community that we do not have purview, it becomes their job to determine who does have purview and then hold them accountable. At that point we would have tried everything.

As I write this public input, it is Monday, August 21 at 8:00 AM. How many more will die between now and when CMP-1 acts on this in January?

Submitter Information Verification

Submitter Full Name: James Dollard

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Submittal Date: Mon Aug 21 07:29:58 EDT 2017

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Public Input No. 332-NFPA 70-2017 [Section No. 90.2(A)]

(A) Covered.

This *Code* covers the installation and removal of electrical conductors, equipment, and raceways; signaling and communications conductors, equipment, and raceways; and optical fiber cables and raceways for the following:

(1) Public and private premises, including buildings, structures, mobile homes, recreational vehicles, and floating buildings

(2) Yards, lots, parking lots, carnivals, and industrial substations

(3) Installations of conductors and equipment that connect to the supply of electricity

(4) Installations used by the electric utility, such as office buildings, warehouses, garages, machine shops, and recreational buildings, that are not an integral part of a generating plant, substation, or control center

(5) Installations used by the electric utility, that is within the premisis wiring system

Statement of Problem and Substantiation for Public Input

metering equipment and transformer are used within the premises wiring system and need to follow the NEC

Submitter Information Verification

This PI has not been submitted yet

Public Input No. 4-NFPA 70-2017 [Section No. 90.2(A)]

(A) _ Covered.

This *Code* covers the installation

and removal

of electrical conductors, equipment, and raceways; signaling and communications conductors, equipment, and raceways; and optical fiber cables ~~and raceways~~ for the following:

(1) Public and private premises, including buildings, structures, mobile homes, recreational vehicles, and floating buildings

(2) Yards, lots, parking lots, carnivals, and industrial substations

(3) Installations of conductors and equipment that connect to the supply of electricity

(4) Installations used by the electric utility, such as office buildings, warehouses, garages, machine shops, and recreational buildings, that are not an integral part of a generating plant, substation, or control center

Statement of Problem and Substantiation for Public Input

Optical fiber raceways are no longer in the NEC. Optical fiber raceways were replaced by communications raceways in the 2014 NEC. The 2017 NEC changed the title of Article 770 from “Optical Fiber Cables and Raceways” to “Optical Fiber Cables”.

Submitter Information Verification

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Submittal Date: Fri Jan 20 10:27:08 EST 2017

Public Input No. 4282-NFPA 70-2017 [Section No. 90.2(A)]

(A) Covered.

This *Code* covers the installation ~~and removal~~ of electrical conductors, equipment, and raceways; signaling and communications conductors, equipment, and raceways; and optical fiber cables and raceways for the following:

(1) Public and private premises, including buildings, structures, mobile homes, recreational vehicles, and floating buildings

(2) Yards, lots, parking lots, carnivals, and industrial substations

(3) Installations of conductors and equipment that connect to the supply of electricity

(4) Installations used by the electric utility, such as office buildings, warehouses, garages, machine shops, and recreational buildings, that are not an integral part of a generating plant, substation, or control center

Statement of Problem and Substantiation for Public Input

The purpose of the code is not to tell us HOW to remove anything. The only "removal" sections merely tell us to remove something. The various sections never tell how to remove anything.

Submitter Information Verification

Submitter Full Name: Matt Hermanson
Organization: A And A Electric Inc
Street Address:
City:
State:
Zip:
Submittal Date: Thu Sep 07 18:48:51 EDT 2017

Public Input No. 4283-NFPA 70-2017 [Section No. 90.2(A)]

(A) Covered.

This *Code* covers the installation and removal of electrical conductors, equipment, and raceways; energy storage devices and equipment; signaling and communications conductors, equipment, and raceways; and optical fiber cables and raceways for the following:

(1) Public and private premises, including buildings, structures, mobile homes, recreational vehicles, and floating buildings

(2) Yards, lots, parking lots, carnivals, and industrial substations

(3) Installations of conductors and equipment that connect to the supply of electricity

(4) Installations used by the electric utility, such as office buildings, warehouses, garages, machine shops, and recreational buildings, that are not an integral part of a generating plant, substation, or control center

Statement of Problem and Substantiation for Public Input

With the addition article 706, energy storage devices are without question a part of the NEC. However, the scope clearly does not state this.

Submitter Information Verification

Submitter Full Name: Matt Hermanson
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City:
State:
Zip:
Submittal Date: Thu Sep 07 18:54:53 EDT 2017

Public Input No. 52-NFPA 70-2017 [Section No. 90.2(A)]

(A) Covered.

This *Code* covers the installation

and removal

of electrical conductors, equipment, and raceways; signaling and communications conductors, equipment, and raceways; and optical fiber cables ~~and raceways~~ for the following:

(1) Public and private premises, including buildings, structures, mobile homes, recreational vehicles, and floating buildings

(2) Yards, lots, parking lots, carnivals, and industrial substations

(3) Installations of conductors and equipment that connect to the supply of electricity

(4) Installations used by the electric utility, such as office buildings, warehouses, garages, machine shops, and recreational buildings, that are not an integral part of a generating plant, substation, or control center

Statement of Problem and Substantiation for Public Input

Optical fiber raceways have been deleted from the NEC.

Submitter Information Verification

Submitter Full Name: Terry Peters
Organization: PLASTICS Industry Association
Affilliation: PLASTICS Industry Association (formerly SPI)
Street Address:
City:
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Submittal Date: Thu Jan 26 05:45:15 EST 2017

Public Input No. 1010-NFPA 70-2017 [Section No. 90.2(B)]

(B) Not Covered.

This *Code* does not cover the following:

(1) Installations in ships, watercraft ~~other than floating buildings~~ , railway rolling stock, aircraft, or automotive vehicles ~~other than mobile homes and recreational vehicles~~

Informational Note: Although the scope of this *Code* indicates that the *Code* does not cover installations in ships, portions of this *Code* are incorporated by reference into Title 46, Code of Federal Regulations, Parts 110–113.

(2) Installations underground in mines and self-propelled mobile surface mining machinery and its attendant electrical trailing cable

(3) Installations of railways for generation, transformation, transmission, energy storage, or distribution of power used exclusively for operation of rolling stock or installations used exclusively for signaling and communications purposes

(4) Installations of communications equipment under the exclusive control of communications utilities located outdoors or in building spaces used exclusively for such installations

(5) Installations under the exclusive control of an electric utility where such installations

(6) Consist of service drops or service laterals, and associated metering, or

(7) Are on property owned or leased by the electric utility for the purpose of communications, metering, generation, control, transformation, transmission, energy storage, or distribution of electric energy, or

(8) Are located in legally established easements or rights-of-way, or

(9) Are located by other written agreements either designated by or recognized by public service commissions, utility commissions, or other regulatory agencies having jurisdiction for such installations. These written agreements shall be limited to installations for the purpose of communications, metering, generation, control, transformation, transmission, energy storage, or distribution of electric energy where legally established easements or rights-of-way cannot be obtained. These installations shall be limited to federal lands, Native American reservations through the U.S. Department of the Interior Bureau of Indian Affairs, military bases, lands controlled by port authorities and state agencies and departments, and lands owned by railroads.

Informational Note to (4) and (5): Examples of utilities may include those entities that are typically designated or recognized by governmental law or regulation by public service/utility commissions and that install, operate, and maintain electric supply (such as generation, transmission, or distribution systems) or communications systems (such as telephone, CATV, Internet, satellite, or data services). Utilities may be subject to compliance with codes and standards covering their regulated activities as adopted under governmental law or regulation. Additional information can be found through consultation with the appropriate governmental bodies, such as state regulatory commissions, the Federal Energy Regulatory Commission, and the Federal Communications Commission.

Statement of Problem and Substantiation for Public Input

Restating what is covered in 90.2(A)(1) is redundant and does not help in clarifying the installations "not covered" in 90.2(B)(1). There is no question that Floating Buildings (Article 553), Mobile Homes(Article 550), and Recreational Vehicles(Article 551) are covered by this code. There is no need to reiterate the fact in 90.2(B)(1).

The deletions of "other than floating buildings" and "other than mobile homes and recreational vehicles" are the only changes proposed for 90.2(B). Please disregard underlined text as that is a Terraview issue.

Submitter Information Verification

Submitter Full Name: David Hittinger
Organization: Independent Electrical Contractors
Affilliation: Independent Electrical Contractors Codes and Standard
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jun 09 20:45:01 EDT 2017

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Public Input No. 251-NFPA 70-2017 [Section No. 90.2(B)]

(B) Not Covered.

This *Code* does not cover the following:

(1) Installations in ships, watercraft other than floating buildings, railway rolling stock, aircraft, or automotive vehicles other than mobile homes and recreational vehicles

Informational Note: Although the scope of this *Code* indicates that the *Code* does not cover installations in ships, portions of this *Code* are incorporated by reference into Title 46, Code of Federal Regulations, Parts 110–113.

(2) Installations underground in mines and self-propelled mobile surface mining machinery and its attendant electrical trailing cable

(3) Installations of railways for generation, transformation, transmission,

energy storage,

or distribution of power used exclusively for operation of rolling stock or installations used exclusively for signaling and communications purposes

(4) Installations of communications equipment under the exclusive control of communications utilities located outdoors or in building spaces used exclusively for such installations

(5) Installations under the exclusive control of an electric utility where such installations

(6) Consist of service drops or service laterals, and meter-mounted equipment and associated metering, or

(7) Are on property owned or leased by the electric utility for the purpose of communications, metering, generation, control, transformation, transmission,

energy storage,

or distribution of electric energy, or

(8) Are located in legally established easements or rights-of-way, or

(9) Are located by other written agreements either designated by or recognized by public service commissions, utility commissions, or other regulatory agencies having jurisdiction for such installations. These written agreements shall be limited to installations for the purpose of communications, metering, generation, control, transformation, transmission,

energy storage,

or distribution of electric energy where legally established easements or rights-of-way cannot be obtained. These installations shall be limited to federal lands, Native American reservations through the U.S. Department of the Interior Bureau of Indian Affairs, military bases, lands controlled by port authorities and state agencies and departments, and lands owned by railroads.

Informational Note to (4) and (5): Examples of utilities may include those entities that are typically designated or recognized by governmental law or regulation by public service/utility commissions and that install, operate, and maintain electric supply (such as generation, transmission, or distribution systems) or communications systems (such as telephone, CATV, Internet, satellite, or data services). Utilities may be subject to compliance with codes and standards covering their regulated activities as adopted under governmental law or regulation. Additional information can be found through consultation with the appropriate governmental bodies, such as state regulatory commissions, the Federal Energy Regulatory Commission, and the Federal Communications Commission.

Statement of Problem and Substantiation for Public Input

Many utility providers will install meter mounted equipment for their customers. Examples of such are meter mounted surge protective devices, meter mounted connection enclosures for grid interactive systems, and meter mounted transfer equipment. These types of equipment are not covered under the term "associated metering", and for that reason the requirements in 90.2(A)(3) will apply to the installation of the equipment. Where the utility provider supplies, installs, and maintains the equipment in question so it remains under their exclusive control, the installation should be considered outside the purview of the NEC. The scope of the UL 1008M Outline for Meter Mounted Transfer Equipment states that it is not UL's intent that the NEC apply to the installation of the equipment.

Submitter Information Verification

Submitter Full Name: Brian Baughman
Organization: Generac Power Systems Inc
Street Address:
City:
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Zip:
Submittal Date: Thu Feb 16 11:58:44 EST 2017

Public Input No. 3876-NFPA 70-2017 [Section No. 90.2(B)]

(B) Not Covered.

This *Code* does not cover the following:

(1) Installations in ships, watercraft other than floating buildings, railway rolling stock, aircraft, or automotive vehicles other than mobile homes and recreational vehicles

Informational Note: Although the scope of this *Code* indicates that the *Code* does not cover installations in ships, portions of this *Code* are incorporated by reference into Title 46, Code of Federal Regulations, Parts 110–113.

(2) Installations underground in mines and self-propelled mobile surface mining machinery and its attendant electrical trailing cable

(3) Installations of railways for generation, transformation, transmission, energy storage, or distribution of power used exclusively for operation of rolling stock or installations used exclusively for signaling and communications purposes

(4) Installations of communications equipment under the exclusive control of communications utilities located outdoors or in building spaces used exclusively for such installations

(5) Installations under the exclusive control of an electric utility or Independent Power Producer (IPP) where such installations

(6) Consist of service drops or service laterals, and associated metering, or

(7) Are on property owned or leased by the electric utility for the purpose of communications, metering, generation, control, transformation, transmission, energy storage, or distribution of electric energy, or

(8) Are located in legally established easements or rights-of-way, or

(9) Are located by other written agreements either designated by or recognized by public service commissions, utility commissions, or other regulatory agencies having jurisdiction for such installations. These written agreements shall be limited to installations for the purpose of communications, metering, generation, control, transformation, transmission, energy storage, or distribution of electric energy where legally established easements or rights-of-way cannot be obtained. These installations shall be limited to federal lands, Native American reservations through the U.S. Department of the Interior Bureau of Indian Affairs, military bases, lands controlled by port authorities and state agencies and departments, and lands owned by railroads.

Informational Note to (4) and (5): Examples of utilities may include those entities that are typically designated or recognized by governmental law or regulation by public service/utility commissions and that install, operate, and maintain electric supply (such as generation, transmission, or distribution systems) or communications systems (such as telephone, CATV, Internet, satellite, or data services). Utilities may be subject to compliance with codes and standards covering their regulated activities as adopted under governmental law or regulation. Additional information can be found through consultation with the appropriate governmental bodies, such as state regulatory commissions, the Federal Energy Regulatory Commission, and the Federal Communications Commission.

Statement of Problem and Substantiation for Public Input

[Note that Terra incorrectly underlines the section following this PI text which is only on line [5]]
The status quo for the large wind industry (typically turbines 1 MW and larger) is that they have been considered exempt from NEC requirements and local AHJ inspection because they:
- comply with NESC requirements
- are generally field inspected and certified by an NRTL
- are generally beyond the capability and experience of local inspectors
They have been considered "behind the fence" despite the distinction in NEC article 90.2(B)(2) that NEC scope does

not apply to utility-controlled generation, but it does apply to IPPs.
In a parallel PI, we suggest that the scope of article 694 should be revised to exclude utilities and Independent Power Producers (IPPs).

The development of this ANSI standard is required to rest on technical, not political, historical or jurisdiction issues. The fact is that a wind farm owned by a utility can be IDENTICAL to one owned by an IPP, and so THE TECHNICAL REQUIREMENTS (AND SCOPE) should also be identical.

This issue was highlighted by Massachusetts choice to exclude article 691 from their 2017 NEC adoption. It's time we recognized that utility and IPP generation is technically the same.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3875-NFPA 70-2017 [Section No. 694.1]	

Submitter Information Verification

Submitter Full Name: Robert Wills
Organization: Intergrid LLC
Affilliation: American Wind Energy Association
Street Address:
City:
State:
Zip:
Submittal Date: Thu Sep 07 05:41:14 EDT 2017

Public Input No. 4254-NFPA 70-2017 [New Section after 90.2(B)]

Add to 'Not Covered' - Independent Power Producers

(6) Installations under the exclusive control of an Independent Power Producer where such installations

a. Are on property owned or leased by the Independent Power Producer for the purpose of communications, metering, generation, control, transformation, transmission, energy storage, or distribution of electric energy and

b. Are connected directly to utility distribution or transmission systems.

Statement of Problem and Substantiation for Public Input

Since deregulation, some Electric Monopolies have divested their power plants to Independent Power Producers (IPP) and IPP's have constructed many new power plants – combined cycle, wind, solar, etc. Some jurisdictions do not consider these plants as 'utilities' even though by definition a public utility is an organization that supply's a community with electricity, gas, water, sewerage, etc. The fact that an IPP is typically not a regulated monopoly does not change the fact that it is still a utility and is still regulated under the Federal Energy Regulatory Commission (FERC) and other public utility commissions.

The power industry has developed independently of the NEC. Power plants are already regulated by the Federal Energy Regulatory Commission (FERC) and regional interconnecting system operators (ISO). Designs are based on many industry standards (ANSI, IEEE, etc.). Local distribution and transmission companies perform engineering reviews before allowing any type of generation interconnection to their systems. Substation equipment that is proven and has been used for many years is not necessarily "listed and labeled". This equipment is manufactured to well accepted and proven industry standards.

Those jurisdictions that attempt to apply the NEC to these IPPs are misusing the NEC as stated in 90.1 "The purpose of this Code is the practical safeguarding of persons and property from hazards arising from the use of electricity." Generation of electricity was never intended to be covered by the NEC. Also, those electrical inspectors that are being required to perform inspections of IPPs are being put in a position that most do not have the expertise of qualifications to be in – that of examining generation, protection, and control systems that are specific to generation plants.

Adding this section to the NEC clarifies that generation plants – whether owned by regulated monopolies or IPPs – are not covered by this code. The NEC has never been a Code for grid tied electrical generating stations and any confusion on this needs to be eliminated. The solution is for the NEC to clearly state that these power plants are not covered by NFPA 70.

Submitter Information Verification

Submitter Full Name: James Cialdea
Organization: CE Power Engineered Services
Street Address:
City:
State:
Zip:
Submittal Date: Thu Sep 07 17:29:51 EDT 2017

Public Input No. 2277-NFPA 70-2017 [Section No. 90.3]

90.3 Code Arrangement.

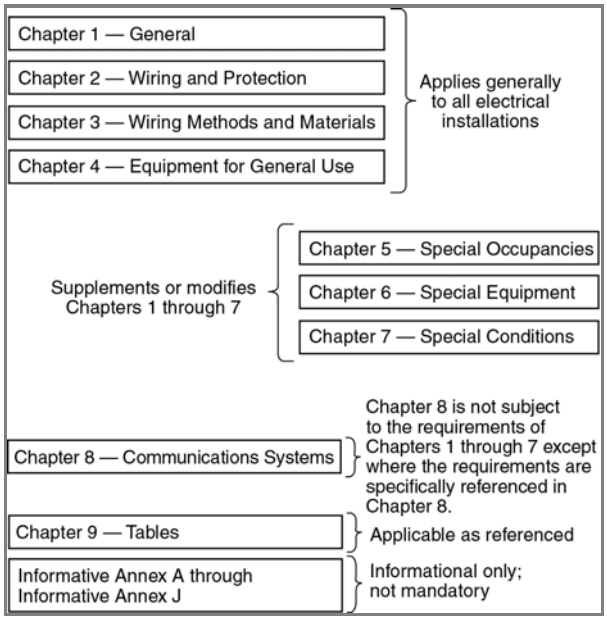
This *Code* is divided into the introduction and nine chapters, as shown in Figure 90.3. Chapters 1, 2, 3, and 4 apply generally. Chapters 5, 6, and 7 apply to special occupancies, special equipment, or other special conditions and may specifically supplement or modify the requirements in Chapters 1through 7.

Chapter 8 covers communications systems and is not subject to the requirements of Chapters 1 through 7 except where the requirements are specifically referenced in Chapter 8.

Chapter 9 consists of tables that are applicable as referenced.

Informative annexes are not part of the requirements of this *Code* but are included for informational purposes only.

Figure 90.3 Code Arrangement.



Statement of Problem and Substantiation for Public Input

Adding the word "specifically" would eliminate any confusion as to whether or not the first 4 chapters always apply, even when Chapters 5, 6 and 7 have their own requirements. With code interpretation there are two schools of thought. If the language specifically states a requirement versus when the code language is silent on the matter. For example, in Chapter 5, where a section requires GFCI protection for 15 and 20 amp, 125 volt receptacles, because the language doesn't specifically address the more strict requirements of 210.8, are we to assume the Chapter 2 requirements apply?

Submitter Information Verification

Submitter Full Name: Dean Hunter
Organization: Minnesota Department of Labor
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 15 18:58:15 EDT 2017

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I, Dean Hunter, hereby irrevocably grant and assign to the National Fire Protection Association (NFPA) all and full rights in copyright in this Public Input (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 Input in this or another similar or derivative form is used. I hereby warrant that I am the author of this Public Input and that I have full power and authority to enter into this copyright assignment.

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Public Input No. 2818-NFPA 70-2017 [Section No. 90.3]

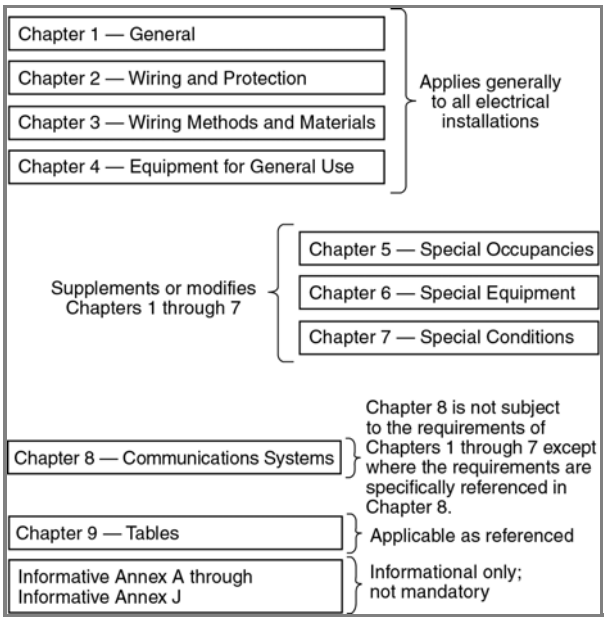
90.3 Code Arrangement.

This *Code* is divided into the introduction and nine chapters, as shown in Figure 90.3. Chapters 1, 2, 3, and 4 apply generally. Chapters 5, 6, ~~and~~ 7 and 8 apply to special occupancies, special equipment, or other special conditions, and communications systems and may supplement or modify the requirements in Chapters 1through ~~7~~ .Chapter 8 ~~covers communications systems and is not subject to the requirements of Chapters 1 through 7 except where the requirements are specifically referenced in Chapter~~ 8 .

Chapter 9 consists of tables that are applicable as referenced.

Informative annexes are not part of the requirements of this *Code* but are included for informational purposes only.

Figure 90.3 Code Arrangement.



Additional Proposed Changes

File Name	Description	Approved
FIGURE_90.3_Code_Arrangement.docx	Please review figure 90.3 Code arrangement	✓

Statement of Problem and Substantiation for Public Input

A Correlating Committee appointed task group assigned to correlate requirements within Chapter 8 and the NEC for clarity and usability submits this public input. The members of the task group are David Hittinger, Chair, Larry Ayer, Jim Dollard, Ernie Gallo, David Kendall, George Straniero, Charles Palmieri, Bill McCoy, Randy Ivans, Robert Jensen, Terry Coleman and George Bish.

The task group identified multiple potential actions to increase clarity and usability in Chapter 8 and throughout the NEC. It became apparent that as we propose removal of redundancy and correlate Chapter 8 with the remainder of the NEC, there no longer seems to be a need to completely isolate Chapter 8 from Chapters 1 through 7.

The task group wishes to revise 90.3 as proposed based upon our ability to ensure there is no negative impact on the telecommunications industry. The task group requests that the Correlating Committee review this body of work in the first draft stage and second draft stage to ensure that there is not a negative impact on the telecommunications

industry.

Please review the attached Word document for changes to 90.3 Code Arrangement. This illustration cannot be edited in Terraview.

Submitter Information Verification

Submitter Full Name: David Hittinger
Organization: Correlating Committee Appointed Task Group
Street Address:
City:
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Submittal Date: Sun Aug 27 15:34:13 EDT 2017

FIGURE 90.3 Code Arrangement.

Chapter 1 — General Chapter 2 — Wiring and Protection Chapter 3 — Wiring Methods and Materials Chapter 4 — Equipment for General Use	Applies generally to all electrical installations
Chapter 5 — Special Occupancies Chapter 6 — Special Equipment Chapter 7 — Special Conditions Chapter 8 — Communications Systems	Supplements or modifies Chapters 1 through ~~7~~ 8
~~Chapter 8 — Communications Systems~~	~~Chapter 8 is not subject to the requirements of Chapters 1 through 7 except where the requirements are specifically referenced in Chapter 8.~~
Chapter 9 — Tables	Applicable as referenced
Informative Annex A through Informative Annex J	Informational only; not mandatory

Public Input No. 3801-NFPA 70-2017 [Section No. 90.3]

90.3 Code Arrangement.

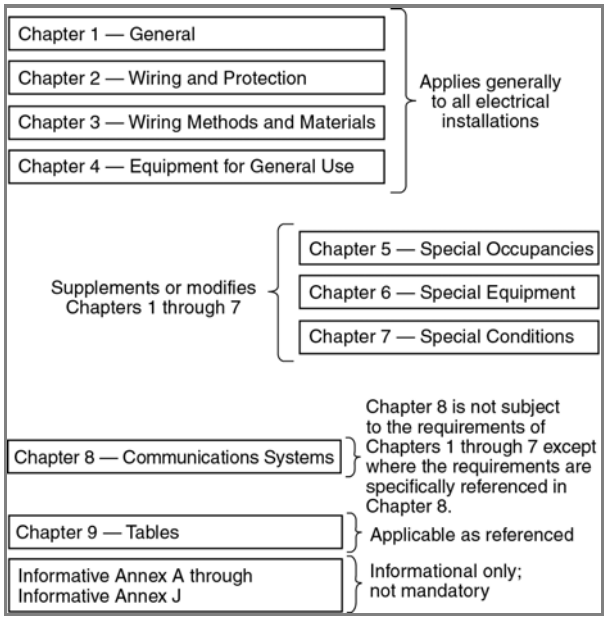
This *Code* is divided into the introduction and nine chapters, as shown in Figure 90.3. Chapters 1, 2, 3, and 4 apply generally. Chapters 5, 6, and 7 apply to special occupancies, special equipment, or other special conditions and may supplement or modify the requirements in Chapters 1through ~~7~~ 4 .

Chapter 8 covers communications systems and is not subject to the requirements of Chapters 1 through 7 except where the requirements are specifically referenced in Chapter 8.

Chapter 9 consists of tables that are applicable as referenced.

Informative annexes are not part of the requirements of this *Code* but are included for informational purposes only.

Figure 90.3 Code Arrangement.



Statement of Problem and Substantiation for Public Input

This was changed in the last cycle with no real substantiation. Although it appears to be a minor change it has caused confusion and problems with application in the field. The previous language worked for many decades with no problems. If Chapter 6 can modify Chapter 5 then someone can place a wind turbine in a classified location and use the installation requirements in Chapter 6 not Chapter 5. In my opinion that creates a problem and does not make sense

Submitter Information Verification

Submitter Full Name: James Rogers
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City:
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Submittal Date: Wed Sep 06 21:53:16 EDT 2017

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Public Input No. 418-NFPA 70-2017 [Section No. 90.3]

90.3 Code Arrangement.

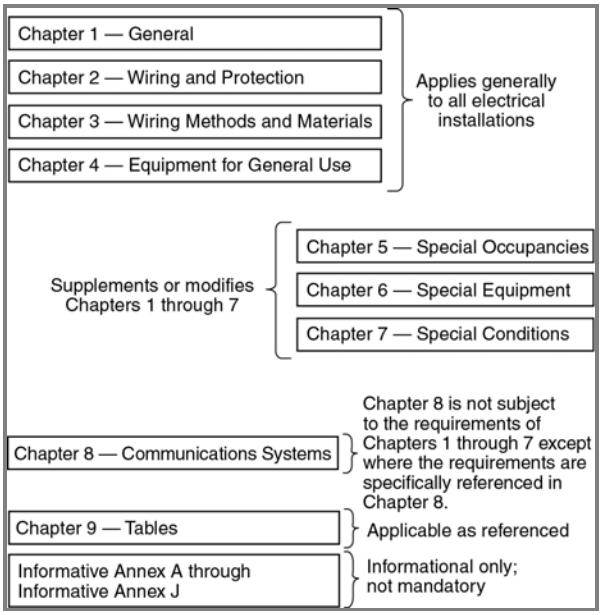
This *Code* is divided into the introduction and nine chapters, as shown in Figure 90.3. Chapters 1, 2, 3, and 4 apply generally. Chapters 5, 6, and 7 apply to special occupancies, special equipment, or other special conditions and may supplement or modify the requirements in Chapters 1 through 7 .

Chapter 8 covers communications systems and is not subject to the requirements of Chapters 1 through 7 except where the requirements are specifically referenced in Chapter 8.

Chapter 9 consists of tables that are applicable as referenced.

Informative annexes are not part of the requirements of this *Code* but are included for informational purposes only.

Figure 90.3 Code Arrangement.



Statement of Problem and Substantiation for Public Input

Usability and layout of Figure 90.3.
Here in TerraView the Figure 90.3 is in the proper placement, but in the printed edition this Figure 90.3 (page 70-31) is following Section 90.4. Actually it is placed inside of Section 90.4. This is or can be confusing to users of the NEC. When instructing on code arrangement and layout this becomes an issue especially to new users of the code. If this was done at the printing stage in the development process it needs to be addressed by a Production Manager or team to exam typesetting, page layout, and proofreading to ensure the quality and accuracy in the finished product.
This problem is a common theme throughout the printed version of the code book and needs to be addressed by each panel or a task group assigned to look at this problem.

Submitter Information Verification

Submitter Full Name: Darryl Hill
Organization: Wichita Electrical JATC
Street Address:
City:
State:
Zip:

Submittal Date: Wed Mar 29 16:58:25 EDT 2017

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Public Input No. 157-NFPA 70-2017 [Section No. 90.4]

90.4 Enforcement.

This *Code* is intended to be suitable for mandatory application by governmental bodies that exercise legal jurisdiction over electrical installations, including signaling and communications systems, and for use by insurance inspectors. The authority having jurisdiction for enforcement of the *Code* has the responsibility for making interpretations of the rules, for deciding on the approval of equipment and materials, and for granting the special permission contemplated in a number of the rules.

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~~ safety when specific rules for the installation are not established in the NEC .

This *Code* may require new products, constructions, or materials that may not yet be available at the time the *Code* is adopted. In such event, the authority having jurisdiction may permit the use of the products, constructions, or materials that comply with the most recent previous edition of this *Code* adopted by the jurisdiction.

Statement of Problem and Substantiation for Public Input

AHJ's are taking this section to mean that they can apply any alternate means to any electrical installation and modify the requirements of any section. Adding this new text will make it clear this section applies only where the specific type of installation is not covered in the NEC. Also see commentary in the NEC handbook which supports this change.

Submitter Information Verification

Submitter Full Name: Alfio Torrisi
Organization: Master electrician
Street Address:
City:
State:
Zip:
Submittal Date: Sat Feb 04 09:19:20 EST 2017

Public Input No. 1794-NFPA 70-2017 [Section No. 90.4]

90.4 Enforcement.

(A) Application . This *Code* is intended to be suitable for mandatory application by governmental bodies that exercise legal jurisdiction over electrical installations, including signaling and communications systems, and for use by insurance inspectors.

(B) Interpretation. The authority having jurisdiction for enforcement of the *Code* has the responsibility for making interpretations of the rules, for deciding on the approval of equipment and materials, and for granting the special permission contemplated in a number of the rules.

(C)Specific Requirements and Alternative Methods. 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.

(D) New Products, Constructions or Materials. This *Code* may require new products, constructions, or materials that may not yet be available at the time the *Code* is adopted. In such event, the authority having jurisdiction may permit the use of the products, constructions, or materials that comply with the most recent previous edition of this *Code* adopted by the jurisdiction.

(E) Existing Systems With Reestablished Service Points. Where an existing service point is reestablished, the existing supply conductors and equipment between the new service point location and the existing service equipment, or new service equipment if the existing service equipment is replaced, shall comply with the applicable requirements in this Code.

Existing electrical installations that do not comply with all the provisions of this Code shall be permitted to be continued in use unless the authority having jurisdiction determines the lack of conformity presents an immnent danger to the premises or occupants.

Informational Note: The definition of service point is provided in Article 100.

Additional Proposed Changes

File Name	Description	Approved
MH_2020_NEC_PI_For_90.4.docx	Provided to assist with the actual recommendations and to provide the substantiation for the changes.	✓

Statement of Problem and Substantiation for Public Input

This public input responds to current needs to recognize existing supply conductors and equipment that previously were under the exclusive control of a serving utility, but are now covered by the NEC due to reestablishing of the service point location. This is a condition or situation that currently exists in almost every area where the NEC is adopted and enforced. The new language introduced in subdivision (E) provides not only a general requirement for these installations to comply with the NEC, but allows the practical and needed relief to allow these existing supply conductors and systems to remain in continued use, which is consistent with current practices in most jurisdictions. To try to apply the NEC to these installations that were built to utility regulations or the rules in the NESC gets extremely complex and would in most cases introduce undue hardships and could even impact safety in some cases. The recommended text also recognizes situations where the existing service equipment is being replaced due to impeding end of useful life failure or more often to reduce the high arc flash energies inherent in the design of these older installations.

Note the new text in (E) was derived from Annex H 80.9(B) that addresses existing installations that should be allowed to remain, unless it is determined to be an imminent danger or other unsafe condition that must be corrected. The text was adjusted to apply to these specific installations and not all existing installations covered by the NEC.

This public input also seeks to add clarity, usability and to bring this section more in line with the Regulations Governing Committee Projects by including separate titled subdivisions.

This is companion public input to one submitted to 230.82 to permit these existing conductors and equipment to be

located ahead of the service disconnecting means and to 230.205 to require a premises isolating device to be installed that will disconnect the premises wiring from the utility supply.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 1795-NFPA 70-2017 [Section No. 230.82]	
Public Input No. 1796-NFPA 70-2017 [Section No. 230.205]	

Submitter Information Verification

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2020 NEC Revisions to Address Systems with Reestablished Service Points

90.4(E) (New)

Revise the existing 90.4 by creating new titled subdivisions and add a new 90.4(E) as follows:

90.4 Enforcement.

(A) Application. This Code is intended to be suitable for mandatory application by governmental bodies that exercise legal jurisdiction over electrical installations, including signaling and communications systems, and for use by insurance inspectors.

(B) Interpretations. The authority having jurisdiction for enforcement of the Code has the responsibility for making interpretations of the rules, for deciding on the approval of equipment and materials, and for granting the special permission contemplated in a number of the rules.

(C) Specific Requirements and Alternative Methods. 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.

(D) New Products, Constructions, or Materials. This Code may require new products, constructions, or materials that may not yet be available at the time the Code is adopted. In such event, the authority having jurisdiction may permit the use of the products, constructions, or materials that comply with the most recent previous edition of this Code adopted by the jurisdiction.

(E) Existing Installations with Reestablished Service Points. Where an existing service point is reestablished, the existing supply conductors and equipment between the new service point location and the existing service equipment, or new service equipment where the existing service equipment is replaced, shall comply with the applicable requirements in this Code.

Existing electrical installations that do not comply with all of the provisions of this Code shall be permitted to be continued in use unless the authority having jurisdiction determines the lack of conformity with this Code presents an imminent danger to the premises or occupants.

Informational Note: The definition of service point is provided in Article 100.

Substantiation:

This public input responds to current needs to recognize existing supply conductors and equipment that previously were under the exclusive control of a serving utility, but are now covered by the NEC due to reestablishing of the service point location. This is a condition or situation that currently exists in almost every area where the NEC is adopted and enforced. The new language introduced in subdivision (E) provides not only a general requirement for these installations to comply with the NEC, but allows the practical and needed relief to allow these existing supply conductors and systems to remain in continued use, which is consistent with current practices in most jurisdictions. To try to apply the NEC to these installations that were built to utility regulations or the rules in the NESC gets extremely complex and would in most cases introduce undue hardships and could even impact safety in some cases. The recommended text also recognizes situations where the existing service equipment is being replaced due to impeding end of useful life failure or more often to reduce the high arc flash energies inherent in the design of these older installations.

Note the new text in (E) was derived from Annex H 80.9(B) that addresses existing installations that should be allowed to remain, unless it is determined to be an imminent danger or other unsafe condition that must be corrected. The text was adjusted to apply to these specific installations and not all existing installations covered by the NEC.

This public input also seeks to add clarity, usability and to bring this section more in line with the Regulations Governing Committee Projects by including separate titled subdivisions.

This is companion public input to one submitted to 230.82 to permit these existing conductors and equipment to be located ahead of the service disconnecting means and to 230.205 to require a premises isolating device to be installed that will disconnect the premises wiring from the utility supply.

Public Input No. 1876-NFPA 70-2017 [Section No. 90.4]

90.4 Enforcement.

~~This~~ ~~*Code*~~ ~~is~~ This *Code and NFPA 70 E Standard for Electrical Safety in the Workplace* is intended to be suitable for mandatory application by governmental bodies that exercise legal jurisdiction over electrical installations and safety, including energized electrical work practices, signaling and communications systems, and for use by insurance inspectors. The authority having jurisdiction for enforcement of the ~~*Code*~~ ~~has~~ *Electrical Code and NFPA 70-E* has the responsibility for making interpretations of the rules, for deciding on the approval of equipment and materials, and for granting the special permission contemplated in a number of the rules.

By special permission, the authority having jurisdiction may waive specific requirements in this *Code*, and NFPA 70-E for emergency work only, without a energized electrical work permit, or permit alternative methods where it is assured that equivalent objectives can be achieved by establishing and maintaining effective safety.

This *Code* may require new products, constructions, or materials that may not yet be available at the time the *Code* is adopted. In such event, the authority having jurisdiction may permit the use of the products, constructions, or materials that comply with the most recent previous edition of this *Code* adopted by the jurisdiction.

Additional Proposed Changes

File Name	Description	Approved
Live_Work_Notice._05.FEB.2015.doc	LIVE WORK NOTICE	✓
.Energized_Electrical_Work_Assessment.doc	LIVE WORK	✓
live_work_notice_information.docx	work notice info	✓
Donnie_s_Accident.url	DON JOHNSON ACCIDENT	✓
Sample_Electric_Energized_Work_Permit.doc	energize work permit	✓
AMENDMENT_70_E_TO_THE_2014_NATIONAL_ELECTRICAL_CODE.docx	90.4	✓
Live_Work_Notice._05.FEB.2015.doc	notice	✓

Statement of Problem and Substantiation for Public Input

The City of Portsmouth has a no live work policy that prohibits live work to be performed without a energized work permit, and other requirements of 70-E . A city live work notice for all worker on the job site to be notified that live work could be performed on the site. This work permit developed by the city would have signatures of all parties, and be displayed on the site. Electrical inspection would not be performed if live work is noticed on the work site.

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Public Input No. 2146-NFPA 70-2017 [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*. Where it has been determined that equipment has been altered from original construction, the authority having jurisdiction shall have the authority to require a feild evaluation to applicable product saftey standards by an approved testing agency as proof of equivalency.

-

Informational Note No. 1: See requirements in 110.3.

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

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

Statement of Problem and Substantiation for Public Input

The 2017 NEC introduced the permission to allow reconditioned equipment and states in 110.21(A)(2) that the approval of the reconditioned equipment shall not be based solely on the equipment's original listing. The original listing applies to the product as it is originally manufactured when shipped from the factory. Authorized use of the listing mark is the manufacturer's declaration that the product was originally manufactured in accordance with the applicable safety requirements. The authority having jurisdiction does not know what the effect the alteration may have on the safety of the product or the continued validity of the listing mark unless the field alterations have been specifically investigated by a field evaluation body. Without a field evaluation of the altered product, the authority having jurisdiction may not be able to determine if the product still complies with the safety requirements of the applicable safety standard. With the field evaluation, the authority having jurisdiction would be able to have basis for approval.

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Public Input No. 3802-NFPA 70-2017 [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*.

Equipment that is reconditioned, refurbished or remanufactured, shall be listed and labeled or field evaluated by an approved field evaluation body to the applicable product standard. Maintenance of equipment shall not be considered to be reconditioning, refurbishing, or remanufacturing.

Informational Note No. 1: See requirements in 110.3.

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

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

Informational Note No. 4: See NFPA 790 for competency requirements for field evaluation bodies, and NFPA 791 for field evaluation labeling and reporting requirements.

Statement of Problem and Substantiation for Public Input

While listing categories exist for some reconditioned, refurbished or remanufactured products, field evaluations can also provide a basis for approval in specific situations such as those mentioned. Input also recognizes the difference between normal equipment maintenance and those that are reconditioned, refurbished, and remanufactured in such a manner that independent evaluation is needed.

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Public Input No. 3227-NFPA 70-2017 [Section No. 90.8(B)]

(B) Number of Circuits in Enclosures.

It is elsewhere provided in this *Code* that the number of circuits confined in a single enclosure be varyingly restricted. Limiting the number of circuits in a single enclosure minimizes the effects from a short circuit or ground fault.

(C) Maintenance and Operation of Equipment.

Electrical installations that provide for safe maintenance of electrical equipment allow for improved safety of personnel by reduction of electric shock and arc-flash hazards.

Informational Note: NFPA 70B Recommended Practice for Electrical Equipment Maintenance, provides further information.

Statement of Problem and Substantiation for Public Input

This provision correlates with the purpose the NEC found in Section 90.1 - the practical safeguarding of persons and property from the hazards that arise from the use of electricity.
It also provides the user direction via a reference to NFPA 70B, Recommended Practice for electrical Equipment Maintenance, and correlates with the purpose of NFPA 70E
The provision gives electrical designers and installers guidance when planning an electrical installation, and also provides an Electrical AHJ with clear code text to augment Section 90.4 when performing enforcement functions.

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Public Input No. 3618-NFPA 70-2017 [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. In general, only those terms that are used in two or more articles are defined in Article 100. Other definitions are included in the article in which they are used but may be referenced in Article 100.

Part I of this article contains definitions intended to apply wherever the terms are used throughout this *Code*. Part II contains definitions applicable to installations and equipment operating at over 1000 volts, nominal.

Part I. General

Accessible (as applied to equipment).

Admitting close approach; not guarded by locked doors, elevation, or other effective means. (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 by the structure 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.

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)

Ampacity.

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

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)

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)

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 [as applied to Hazardous (Classified) Locations].

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 may 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 [as applied to Hazardous (Classified) Locations].

Apparatus in which the circuits are not necessarily nonincendive themselves but that affect the energy in nonincendive field wiring circuits and are relied upon to maintain nonincendive energy levels. Such apparatus are 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

(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 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)

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

Battery System.

Interconnected battery subsystems consisting of one or more storage batteries and battery chargers, and can include inverters, converters, and associated electrical equipment. (CMP-13)

Bonded (Bonding).

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

Bonding Conductor or Jumper.

A reliable conductor to ensure the required electrical conductivity between metal parts required to be electrically connected. (CMP-5)

Bonding Jumper, Equipment.

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

Bonding Jumper, Main.

The connection between the grounded circuit conductor and the equipment grounding conductor at the service. (CMP-5)

Bonding Jumper, System.

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)

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, Multiwire.

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

Building.

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

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 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)

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)

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.

Adjustable (as applied to circuit breakers).

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.

Instantaneous Trip (as applied to circuit breakers).

A qualifying term indicating that no delay is purposely introduced in the tripping action of the circuit breaker.

Inverse Time (as applied to circuit breakers).

A qualifying term indicating that there is purposely introduced a delay in the tripping action of the circuit breaker, which delay decreases as the magnitude of the current increases.

Nonadjustable (as applied to circuit breakers).

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.

Setting (of circuit breakers).

The value of current, time, or both, at which an adjustable circuit breaker is set to trip.

Clothes Closet.

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

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)

Combustible Dust [as applied to Hazardous (Classified) Locations].

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, *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 [as applied to Hazardous (Classified) Locations].

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

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 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)

Composite Optical Fiber Cable.

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

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.

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)

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)

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, 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)

Continuous Load.

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

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 Drawing [as applied to Hazardous (Classified) Locations].

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)

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)

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 maximum 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, where the copper forms a minimum of 10 percent of the cross-sectional area of a solid conductor or each strand of a stranded conductor. (CMP-6)

Cord Connector [as applied to Hazardous (Classified) Locations].

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

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)

Dead Front.

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

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)

Device.

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

Dust-Ignitionproof [as applied to Hazardous (Classified) Locations].

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: For further information on dust-ignitionproof enclosures, see ANSI/UL 1202-2013, *Enclosures for Electrical Equipment,* and ANSI/UL 1203-2013, *Explosionproof and Dust-Ignitionproof Electrical Equipment for Hazardous (Classified) Locations*.

Dusttight.

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

> Informational Note No. 1: Enclosure Types 3, 3S, 3SX, 4, 4X, 5, 6, 6P, 12, 12K, and 13, per ANSI/NEMA 250-2014, *Enclosures for Electrical Equipment*, are considered dusttight and suitable for use in unclassified locations and in Class II, Division 2; Class III; and Zone 22 hazardous (classified) locations.
>
> Informational Note No. 2: For further information, see ANSI/ISA-12.12.01-2013, *Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations*.

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, 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, Multifamily.

A building that contains three or more 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)

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)

Electric Power Production and Distribution Network.

Power production, distribution, and utilization equipment and facilities, such as electric utility systems that deliver electric power to the connected loads, that are external to and not controlled by an interactive system. (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-Discharge Lighting.

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

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)

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)

Enclosed.

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

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)

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)

Explosionproof Equipment.

Equipment enclosed in a case that is capable of withstanding an explosion of a specified gas or vapor that may occur within it and 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 thereby. (CMP-14)

Informational Note: For further information, see ANSI/UL 1203-2009, *Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations.*

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)

Externally Operable.

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

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-2)

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,** 2012] (CMP-1)

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. (CMP-1)

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)

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: For commercial garages, repair and storage, see Article 511.

Ground.

The earth. (CMP-5)

Ground Fault.

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)

Grounded (Grounding).

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

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)

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 current to ground exceeds the values established for a Class A device. (CMP-2)

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

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, 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; and the earth itself.

Ground-Fault Protection of Equipment.

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)

Grounding Conductor, Equipment (EGC).

The conductive path(s) that provides a 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.

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)

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)

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)

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 [as applied to Hazardous (Classified) Locations].

Equipment sealed against the entrance of an external atmosphere where the seal is made by fusion, for example, soldering, brazing, welding, or the fusion of glass to metal. (CMP-14)

Informational Note: For further information, see ANSI/ISA-12.12.01-2013, *Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations*.

Hoistway.

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

Hybrid System.

A system comprised of multiple power sources. These power sources could include photovoltaic, wind, micro-hydro generators, engine-driven generators, and others, but do not include electric power production and distribution network systems. Energy storage systems such as batteries, flywheels, or superconducting magnetic storage equipment do not constitute a power source for the purpose of this definition. The energy regenerated by an overhauling (descending) elevator does not constitute a power source for the purpose of this definition. (CMP-4)

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)

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)

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 800.2. (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*.

Innerduct.

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

Interactive Inverter.

An inverter intended for use in parallel with an electric utility to supply common loads that may deliver power to the utility. (CMP-13)

Interactive System.

An electric power production system that is operating in parallel with and capable of delivering energy to an electric primary source supply system. (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.

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

Intrinsically Safe Apparatus.

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

Intrinsically Safe System [as applied to Hazardous (Classified) Locations].

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

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

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)

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)

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.

Live Parts.

Energized conductive components. (CMP-1)

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.

Installations underground or in concrete slabs or masonry in direct contact with the earth; in locations subject to saturation with water or other liquids, such as vehicle washing areas; and in unprotected locations exposed to weather. (CMP-1)

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)

Mobile Equipment.

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

Motor Control Center.

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

Multioutlet Assembly.

A type of surface, flush, or freestanding raceway designed to hold conductors and receptacles, assembled in the field or at the factory. (CMP-18)

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.

Nonautomatic.

Requiring human intervention to perform a function. (CMP-1)

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)

Nonincendive Circuit [as applied to Hazardous (Classified) Locations].

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: Conditions are described in ANSI/ISA-12.12.01-2013, *Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations*.

Nonincendive Component [as applied to Hazardous (Classified) Locations].

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 a nonincendive component is not intended to exclude the flammable atmosphere or contain an explosion. (CMP-14)

> Informational Note: For further information, see ANSI/ISA-12.12.01-2013, *NonincendiveElectrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations.*

Nonincendive Equipment [as applied to Hazardous (Classified) Locations].

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/ISA-12.12.01-2013, *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 [as applied to Hazardous (Classified) Locations].

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 [as applied to Hazardous (Classified) Locations].

Apparatus intended to be connected to nonincendive field wiring. (CMP-14)

> Informational Note: For further information, see ANSI/ISA-12.12.01-2013, *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.

Oil Immersion [as applied to Hazardous (Classified) Locations].

Electrical equipment immersed in a protective liquid in such a way that an explosive atmosphere that may be above the liquid or outside the enclosure cannot be ignited. (CMP-14)

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.

Outlet.

A point on the wiring system at which current is taken to supply utilization equipment. (CMP-1)

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)

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.

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, Supplementary.

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)

Overload.

Operation of equipment in excess of normal, full-load rating, or of a conductor in excess of rated 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)

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 or cutout box placed in or against a wall, partition, or other support; and accessible only from the front. (CMP-9)

Photovoltaic (PV) System.

The total components and subsystem that, in combination, convert solar energy into electric energy for connection to a utilization load. (CMP-4)

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)

Portable Equipment.

Equipment with electrical components suitable to be moved by a single person without mechanical aids. (CMP-14)

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-19)

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 [as applied to Hazardous (Classified) Locations].

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)

Process Seal [as applied to Hazardous (Classified) Locations].

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)

Purged and Pressurized [as applied to Hazardous (Classified) Locations].

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: For further information, see ANSI/NFPA 496-2013, *Purged and Pressurized Enclosures for Electrical Equipment*.

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-2012, *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.

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)

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. A multiple receptacle is two or more contact devices on the same yoke. (CMP-18)

Receptacle Outlet.

An outlet where one or more receptacles are installed. (CMP-18)

Remote-Control Circuit.

Any electrical circuit that controls any other circuit through a relay or an equivalent device. (CMP-3)

Retrofit Kit.

A general term for a complete subassembly of parts and devices for field conversion of utilization equipment. (CMP-18)

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.

Separately Derived System.

An electrical source, 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 for delivering electric energy from the serving utility to the wiring system of the premises served. (CMP-4)

Service Cable.

Service conductors made up in the form of a cable. (CMP-4)

Service Conductors.

The conductors from the service point to the service disconnecting means. (CMP-4)

Service Conductors, Overhead.

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-4)

Service Conductors, Underground.

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-4)

> 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 utility electric supply system and the service point. (CMP-4)

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-4)

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-4)

> 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, usually consisting of a circuit breaker(s) or switch(es) and fuse(s) and their accessories, connected to the load end of service conductors to a building or other structure, or an otherwise designated area, and intended to constitute the main control and cutoff of the supply. (CMP-4)

Service Lateral.

The underground conductors between the utility electric supply system and the service point. (CMP-4)

Service Point.

The point of connection between the facilities of the serving utility and the premises wiring. (CMP-4)

> 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.

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)

Signaling Circuit.

Any electrical circuit that energizes signaling equipment. (CMP-3)

Simple Apparatus [as applied to Hazardous (Classified) Locations].

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: The following apparatus are examples of simple apparatus:

(1) Passive components; for example, switches, 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

Special Permission.

The written consent of the authority having jurisdiction. (CMP-1)

Stand-Alone System.

A system that supplies power independently of an electrical production and distribution network.(CMP-4)

Structure.

That which is built or constructed, other than equipment. (CMP-1)

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-5)

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:

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.

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.

Type 3: Point of utilization SPDs.

Type 4: Component SPDs, including discrete components, as well as assemblies. (CMP-5)

Informational Note: For further information on Type 1, Type 2, Type 3, and Type 4 SPDs, see UL 1449, *Standard for Surge Protective Devices*.

Switch, Bypass Isolation.

A manually 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.

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.

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.

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, 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.

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.

Thermally Protected (as applied to motors).

The words *Thermally Protected* appearing on the nameplate of a motor or motor-compressor indicate that the motor is provided with a thermal protector. (CMP-11)

Unclassified Locations [as applied to Hazardous (Classified) Locations].

Locations determined to be neither Class I, Division 1; Class I, Division 2; Class I, Zone 0; Class I, Zone 1; Class I, 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)

Ungrounded.

Not connected to ground or to a conductive body that extends the ground connection. (CMP-5)

Uninterruptible Power Supply.

A power supply used to provide alternating current power to a load for some period of time in the event of a power failure. (CMP-13)

> Informational Note: In addition, it may provide a more constant voltage and frequency supply to the load, reducing the effects of voltage and frequency variations.

Utilization Equipment.

Equipment that utilizes electric energy for electronic, electromechanical, chemical, heating, lighting, or similar purposes. (CMP-1)

Ventilated.

Provided with a means to permit circulation of air sufficient to remove an excess of heat, fumes, or vapors. (CMP-14)

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).*

Informational Note No. 3: Certain battery units may be considered to be rated at nominal 48 volts dc, but may have a charging float voltage up to 58 volts. In dc applications, 60 volts is used to cover the entire range of float voltages.

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.

Part II. Hazardous (Classified) Locations, as applied to

"Relocate all definitions that are [as applied to Hazardous (Classified) Locations]. to this new Part II"

Part II. Over 1000 Volts, Nominal

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. Electronically actuated fuses may or may not operate in a current-limiting fashion, depending on the type of control selected. (CMP-10)

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.

Controlled Vented Power Fuse.

A fuse with provision for controlling discharge circuit interruption such that no solid material may be exhausted into the surrounding atmosphere.

Informational Note: The fuse is designed so that discharged gases will not ignite or damage insulation in the path of the discharge or propagate a flashover to or between grounded members or conduction members in the path of the discharge where the distance between the vent and such insulation or conduction members conforms to manufacturer's recommendations.

Expulsion Fuse Unit (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.

Nonvented Power Fuse.

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

Power Fuse Unit.

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.

Vented Power Fuse.

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

Multiple Fuse.

An assembly of two or more single-pole fuses. (CMP-10)

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)

Switching Device.

A device designed to close, open, or both, one or more electrical circuits. (CMP-1)

Circuit Breaker.

A switching device capable of making, carrying, and interrupting currents under normal circuit conditions, and also of making, carrying for a specified time, and interrupting currents under specified abnormal circuit conditions, such as those of short circuit.

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 Means.

A device, group of devices, or other means whereby the conductors of a circuit can be disconnected from their source of supply.

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.

Additional Proposed Changes

File Name	Description	Approved

Article_100_new_Part_II.pdf New Part II for Article 100 ✓

Statement of Problem and Substantiation for Public Input

Many definitions from Hazardous Locations were moved from Chapter 5 Articles to Article 100 to meet the scope of Article 100 "...only those terms that are used in two or more articles are defined in Article 100." What was added to each of these definitions, when they were brought to Article 100, are brackets indicating these definitions are to apply to hazardous (classified) locations. This is good, but they are still hard to find and will even be more difficult to find in later editions due to losing the gray highlight. For the user of the code I find it difficult to locate some of these definitions that are now scattered and buried among the other general definitions in Article 100. Therefore for the usability of locating and using the 20 definitions that apply to Hazardous (Classified) Locations a new Part II should be created and move existing Part II Over 1000 Volts, Nominal to Part III.
All definitions that apply exclusive to Hazardous (Classified) Locations would be in a new Part II. Hazardous (Classified) Locations, as applied to
See attached pdf for layout.

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Article 100 --- Definitions

Part II. Hazardous (Classified) Locations, as applied to

Associated Apparatus. "definition unaltered"

Associated Nonincendive Field Wiring Apparatus. "definition unaltered"

Combustible Dust. "definition unaltered"

Combustible Gas Detection System. "definition unaltered"

Control Drawing. "definition unaltered"

Cord Connector. "definition unaltered"

Dust-Ignitionproof. "definition unaltered"

Hermetically Sealed. "definition unaltered"

Intrinsically Safe System. "definition unaltered"

Nonincendive Circuit. "definition unaltered"

Nonincendive Component. "definition unaltered"

Nonincendive Equipment. "definition unaltered"

Nonincendive Field Wiring. "definition unaltered"

Nonincendive Field Wiring Apparatus. "definition unaltered"

Oil Immersion. "definition unaltered"

Pressurized. "definition unaltered"

Process Seal. "definition unaltered"

Purged and Pressurized. "definition unaltered"

Simple Apparatus. "definition unaltered"

Unclassified Locations. "definition unaltered"

Part III. Over 1000 Volts, Nominal

Public Input No. 548-NFPA 70-2017 [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. In general, only those terms that are used in two or more articles are defined in Article 100. Other definitions are included in the article in which they are used but may be referenced in Article 100.

Part I of this article contains definitions intended to apply wherever the terms are used throughout this *Code*. Part II contains definitions applicable to installations and equipment operating at over 1000 volts, nominal.

Part I. General

Accessible (as applied to equipment).

Admitting close approach; not guarded by locked doors, elevation, or other effective means. (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 by the structure 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.

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)

Ampacity.

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

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)

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)

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 [as applied to Hazardous (Classified) Locations].

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 may 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 [as applied to Hazardous (Classified) Locations].

Apparatus in which the circuits are not necessarily nonincendive themselves but that affect the energy in nonincendive field wiring circuits and are relied upon to maintain nonincendive energy levels. Such apparatus are 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

(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 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)

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

Battery System.

Interconnected battery subsystems consisting of one or more storage batteries and battery chargers, and can include inverters, converters, and associated electrical equipment. (CMP-13)

Bonded (Bonding).

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

Bonding Conductor or Jumper.

A reliable conductor to ensure the required electrical conductivity between metal parts required to be electrically connected. (CMP-5)

Bonding Jumper, Equipment.

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

Bonding Jumper, Main.

The connection between the grounded circuit conductor and the equipment grounding conductor at the service. (CMP-5)

Bonding Jumper, System.

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)

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, Multiwire.

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

Building.

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

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 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)

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)

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.

Adjustable (as applied to circuit breakers).

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.

Instantaneous Trip (as applied to circuit breakers).

A qualifying term indicating that no delay is purposely introduced in the tripping action of the circuit breaker.

Inverse Time (as applied to circuit breakers).

A qualifying term indicating that there is purposely introduced a delay in the tripping action of the circuit breaker, which delay decreases as the magnitude of the current increases.

Nonadjustable (as applied to circuit breakers).

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.

Setting (of circuit breakers).

The value of current, time, or both, at which an adjustable circuit breaker is set to trip.

Clothes Closet.

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

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)

Combustible Dust [as applied to Hazardous (Classified) Locations].

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, *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 [as applied to Hazardous (Classified) Locations].

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

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 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)

Composite Optical Fiber Cable.

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

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.

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)

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)

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, 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)

Continuous Load.

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

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 Drawing [as applied to Hazardous (Classified) Locations].

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)

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)

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 maximum 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, where the copper forms a minimum of 10 percent of the cross-sectional area of a solid conductor or each strand of a stranded conductor. (CMP-6)

Cord Connector [as applied to Hazardous (Classified) Locations].

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

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)

Dead Front.

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

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)

Device.

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

Documentaion.

Any written or electronic data or information relative to the apparatus, including information on its operational checks, diagnostic checks, inspection, maintenance, and performance testing. Any data or information supplied by the manufacturer or contracter to electrical equipment.

Dust-Ignitionproof [as applied to Hazardous (Classified) Locations].

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: For further information on dust-ignitionproof enclosures, see ANSI/UL 1202-2013, *Enclosures for Electrical Equipment,* and ANSI/UL 1203-2013, *Explosionproof and Dust-Ignitionproof Electrical Equipment for Hazardous (Classified) Locations*.

Dusttight.

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

> Informational Note No. 1: Enclosure Types 3, 3S, 3SX, 4, 4X, 5, 6, 6P, 12, 12K, and 13, per ANSI/NEMA 250-2014, *Enclosures for Electrical Equipment*, are considered dusttight and suitable for use in unclassified locations and in Class II, Division 2; Class III; and Zone 22 hazardous (classified) locations.
>
> Informational Note No. 2: For further information, see ANSI/ISA-12.12.01-2013, *Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations*.

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, 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, Multifamily.

A building that contains three or more 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)

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)

Electric Power Production and Distribution Network.

Power production, distribution, and utilization equipment and facilities, such as electric utility systems that deliver electric power to the connected loads, that are external to and not controlled by an interactive system. (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-Discharge Lighting.

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

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)

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)

Enclosed.

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

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)

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)

Explosionproof Equipment.

Equipment enclosed in a case that is capable of withstanding an explosion of a specified gas or vapor that may occur within it and 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 thereby. (CMP-14)

Informational Note: For further information, see ANSI/UL 1203-2009, *Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations.*

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)

Externally Operable.

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

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-2)

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,** 2012] (CMP-1)

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. (CMP-1)

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)

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: For commercial garages, repair and storage, see Article 511.

Ground.

The earth. (CMP-5)

Ground Fault.

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)

Grounded (Grounding).

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

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)

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 current to ground exceeds the values established for a Class A device. (CMP-2)

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

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, 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; and the earth itself.

Ground-Fault Protection of Equipment.

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)

Grounding Conductor, Equipment (EGC).

The conductive path(s) that provides a 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.

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)

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)

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)

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 [as applied to Hazardous (Classified) Locations].

Equipment sealed against the entrance of an external atmosphere where the seal is made by fusion, for example, soldering, brazing, welding, or the fusion of glass to metal. (CMP-14)

> Informational Note: For further information, see ANSI/ISA-12.12.01-2013, *Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations*.

Hoistway.

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

Hybrid System.

A system comprised of multiple power sources. These power sources could include photovoltaic, wind, micro-hydro generators, engine-driven generators, and others, but do not include electric power production and distribution network systems. Energy storage systems such as batteries, flywheels, or superconducting magnetic storage equipment do not constitute a power source for the purpose of this definition. The energy regenerated by an overhauling (descending) elevator does not constitute a power source for the purpose of this definition. (CMP-4)

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)

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)

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 800.2. (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*.

Innerduct.

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

Interactive Inverter.

An inverter intended for use in parallel with an electric utility to supply common loads that may deliver power to the utility. (CMP-13)

Interactive System.

An electric power production system that is operating in parallel with and capable of delivering energy to an electric primary source supply system. (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.

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

Intrinsically Safe Apparatus.

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

Intrinsically Safe System [as applied to Hazardous (Classified) Locations].

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

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

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)

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)

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.

Live Parts.

Energized conductive components. (CMP-1)

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.

Installations underground or in concrete slabs or masonry in direct contact with the earth; in locations subject to saturation with water or other liquids, such as vehicle washing areas; and in unprotected locations exposed to weather. (CMP-1)

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)

Mobile Equipment.

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

Motor Control Center.

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

Multioutlet Assembly.

A type of surface, flush, or freestanding raceway designed to hold conductors and receptacles, assembled in the field or at the factory. (CMP-18)

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.

Nonautomatic.

Requiring human intervention to perform a function. (CMP-1)

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)

Nonincendive Circuit [as applied to Hazardous (Classified) Locations].

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: Conditions are described in ANSI/ISA-12.12.01-2013, *Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations*.

Nonincendive Component [as applied to Hazardous (Classified) Locations].

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 a nonincendive component is not intended to exclude the flammable atmosphere or contain an explosion. (CMP-14)

> Informational Note: For further information, see ANSI/ISA-12.12.01-2013, *NonincendiveElectrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations.*

Nonincendive Equipment [as applied to Hazardous (Classified) Locations].

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/ISA-12.12.01-2013, *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 [as applied to Hazardous (Classified) Locations].

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 [as applied to Hazardous (Classified) Locations].

Apparatus intended to be connected to nonincendive field wiring. (CMP-14)

> Informational Note: For further information, see ANSI/ISA-12.12.01-2013, *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.

Oil Immersion [as applied to Hazardous (Classified) Locations].

Electrical equipment immersed in a protective liquid in such a way that an explosive atmosphere that may be above the liquid or outside the enclosure cannot be ignited. (CMP-14)

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.

Outlet.

A point on the wiring system at which current is taken to supply utilization equipment. (CMP-1)

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)

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.

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, Supplementary.

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)

Overload.

Operation of equipment in excess of normal, full-load rating, or of a conductor in excess of rated 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)

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 or cutout box placed in or against a wall, partition, or other support; and accessible only from the front. (CMP-9)

Photovoltaic (PV) System.

The total components and subsystem that, in combination, convert solar energy into electric energy for connection to a utilization load. (CMP-4)

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)

Portable Equipment.

Equipment with electrical components suitable to be moved by a single person without mechanical aids. (CMP-14)

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-19)

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 [as applied to Hazardous (Classified) Locations].

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)

Process Seal [as applied to Hazardous (Classified) Locations].

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)

Purged and Pressurized [as applied to Hazardous (Classified) Locations].

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: For further information, see ANSI/NFPA 496-2013, *Purged and Pressurized Enclosures for Electrical Equipment*.

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-2012, *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.

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)

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. A multiple receptacle is two or more contact devices on the same yoke. (CMP-18)

Receptacle Outlet.

An outlet where one or more receptacles are installed. (CMP-18)

Remote-Control Circuit.

Any electrical circuit that controls any other circuit through a relay or an equivalent device. (CMP-3)

Retrofit Kit.

A general term for a complete subassembly of parts and devices for field conversion of utilization equipment. (CMP-18)

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.

Separately Derived System.

An electrical source, 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 for delivering electric energy from the serving utility to the wiring system of the premises served. (CMP-4)

Service Cable.

Service conductors made up in the form of a cable. (CMP-4)

Service Conductors.

The conductors from the service point to the service disconnecting means. (CMP-4)

Service Conductors, Overhead.

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-4)

Service Conductors, Underground.

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-4)

> 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 utility electric supply system and the service point. (CMP-4)

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-4)

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-4)

> 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, usually consisting of a circuit breaker(s) or switch(es) and fuse(s) and their accessories, connected to the load end of service conductors to a building or other structure, or an otherwise designated area, and intended to constitute the main control and cutoff of the supply. (CMP-4)

Service Lateral.

The underground conductors between the utility electric supply system and the service point. (CMP-4)

Service Point.

The point of connection between the facilities of the serving utility and the premises wiring. (CMP-4)

> 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.

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)

Signaling Circuit.

Any electrical circuit that energizes signaling equipment. (CMP-3)

Simple Apparatus [as applied to Hazardous (Classified) Locations].

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: The following apparatus are examples of simple apparatus:

(1) Passive components; for example, switches, 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

Special Permission.

The written consent of the authority having jurisdiction. (CMP-1)

Stand-Alone System.

A system that supplies power independently of an electrical production and distribution network.(CMP-4)

Structure.

That which is built or constructed, other than equipment. (CMP-1)

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-5)

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:

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.

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.

Type 3: Point of utilization SPDs.

Type 4: Component SPDs, including discrete components, as well as assemblies. (CMP-5)

Informational Note: For further information on Type 1, Type 2, Type 3, and Type 4 SPDs, see UL 1449, *Standard for Surge Protective Devices*.

Switch, Bypass Isolation.

A manually 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.

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.

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.

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, 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.

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.

Thermally Protected (as applied to motors).

The words *Thermally Protected* appearing on the nameplate of a motor or motor-compressor indicate that the motor is provided with a thermal protector. (CMP-11)

Unclassified Locations [as applied to Hazardous (Classified) Locations].

Locations determined to be neither Class I, Division 1; Class I, Division 2; Class I, Zone 0; Class I, Zone 1; Class I, 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)

Ungrounded.

Not connected to ground or to a conductive body that extends the ground connection. (CMP-5)

Uninterruptible Power Supply.

A power supply used to provide alternating current power to a load for some period of time in the event of a power failure. (CMP-13)

> Informational Note: In addition, it may provide a more constant voltage and frequency supply to the load, reducing the effects of voltage and frequency variations.

Utilization Equipment.

Equipment that utilizes electric energy for electronic, electromechanical, chemical, heating, lighting, or similar purposes. (CMP-1)

Ventilated.

Provided with a means to permit circulation of air sufficient to remove an excess of heat, fumes, or vapors. (CMP-14)

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).*

Informational Note No. 3: Certain battery units may be considered to be rated at nominal 48 volts dc, but may have a charging float voltage up to 58 volts. In dc applications, 60 volts is used to cover the entire range of float voltages.

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.

Part II. Over 1000 Volts, Nominal

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. Electronically actuated fuses may or may not operate in a current-limiting fashion, depending on the type of control selected. (CMP-10)

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.

Controlled Vented Power Fuse.

A fuse with provision for controlling discharge circuit interruption such that no solid material may be exhausted into the surrounding atmosphere.

Informational Note: The fuse is designed so that discharged gases will not ignite or damage insulation in the path of the discharge or propagate a flashover to or between grounded members or conduction members in the path of the discharge where the distance between the vent and such insulation or conduction members conforms to manufacturer's recommendations.

Expulsion Fuse Unit (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.

Nonvented Power Fuse.

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

Power Fuse Unit.

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.

Vented Power Fuse.

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

Multiple Fuse.

An assembly of two or more single-pole fuses. (CMP-10)

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)

Switching Device.

A device designed to close, open, or both, one or more electrical circuits. (CMP-1)

Circuit Breaker.

A switching device capable of making, carrying, and interrupting currents under normal circuit conditions, and also of making, carrying for a specified time, and interrupting currents under specified abnormal circuit conditions, such as those of short circuit.

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 Means.

A device, group of devices, or other means whereby the conductors of a circuit can be disconnected from their source of supply.

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.

Statement of Problem and Substantiation for Public Input

Previously undefined in NFPA 70, this definition is found in NFPA Glossary of Terms 1071 (2016). Defining this word that is located in multiple code sections will promote consistency with AHJs.

Submitter Information Verification

Submitter Full Name: Kyle Rood
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State:
Zip:
Submittal Date: Mon Apr 17 10:54:06 EDT 2017

Public Input No. 1202-NFPA 70-2017 [Article 100 [Excluding any Sub-Sections]]

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. In general, only those terms that are used in two or more articles are defined in Article 100. ~~Other definitions are included in the article in which they are used but may be referenced in Article 100 .~~ Definitions are also found in the xxx.2 sections of other articles.

Part I of this article contains definitions intended to apply wherever the terms are used throughout this *Code*. Part II contains definitions applicable to installations and equipment operating at over 1000 volts, nominal.

Statement of Problem and Substantiation for Public Input

This public input is submitted on behalf of task group appointed by the NEC Correlating Committee. This task group was appointed to identify potential issues in the NEC with respect to how definitions in both Article 100 and the XXX.2 sections of this Code apply. The member of the task group are: David Hittinger, Rich Holub, Chris Hunter, Dave Williams, Chris Porter, Alan Manche, Ken Boyce, John Kovacik, Donny Cook, Dave Kendall and Jim Dollard.

Section 2.2.2.1 of the NEC Style Manual requires that in general definitions that appear in two or more articles be located in Article 100. Section 2.2.2.2 requires that where an individual article contains definition(s), they be located in the second section (XXX.2) of the article. It is extremely important to note that the style manual does not prohibit a definition in the second section of an article from applying elsewhere in the NEC. The style manual clearly states that in general definitions that appear in two or more articles shall be located in Article 100. This has confused many code users in the past. This style manual requirement is accurate and these public inputs are simply an attempt to provide needed clarity. See the example below:

344.2 Definition.
Rigid Metal Conduit (RMC). 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.

The definition of the term “rigid metal conduit” is appropriately located in the article that contains general, installation and construction specifications for this raceway. It is commonly understood that the term “rigid metal conduit” is used in more than one article. There are many articles that contain a single definition that is necessary for application of the contained requirements but will apply elsewhere in the NEC. This occurs in articles that address cable assemblies, raceways, systems and more.
This public input seeks to delete the last sentence in the first paragraph, as it is unnecessary. A new sentence is proposed to simply inform the user of the code that definitions are also found in the second section (XXX.2) of other articles.
This public input is supplemented with proposed revisions to the second section (XXX.2) of articles that contain definitions. New parent text is proposed for these sections to increase clarity and usability. There are two different scenarios that will be addressed. First, any second section (XXX.2) that contains definitions that apply only within that article will contain parent text as follows:

XXX.2 Definitions. The definitions in this section shall apply only within this article.

Second, any second section (XXX.2) that contains definitions that apply within the individual article and throughout the code will contain parent text as follows:

XXX.2 Definitions. The definitions in this section shall apply within this article and throughout the code.

In a few cases, in the second section (XXX.2) of an Article there are definitions that will apply only in that Article and some that will apply in that Article and throughout the code. New parent text and first level subdivisions are proposed to achieve clarity and usability The combination of these proposed revisions will provide necessary clarity and usability with respect to application of definitions. These actions will also achieve compliance with the NEC Style Manual.

Submitter Information Verification

Submitter Full Name: James Dollard
Organization: IBEW Local Union 98
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jul 21 08:49:23 EDT 2017

Public Input No. 1009-NFPA 70-2017 [Definition: Accessible (as applied to equipment).]

Accessible (as applied to equipment).

Admitting close approach; ~~not guarded by locked doors, elevation, or other effective means~~ capable of being reached for operation, renewal, and inspection . (CMP-1)

Statement of Problem and Substantiation for Public Input

The definition of accessible (as applied to equipment) contradicts other sections of the code. The use of a locked equipment room is common practice under controlled or supervised conditions. By stating that equipment is not accessible, if guarded by locked doors, contradicts 110.26(F) and causes inconsistency in code enforcement.

Equipment can still be considered accessible, despite being elevated. Sections 110.26(A)(4), 300.23, and 600.21(F) identify equipment installed above lay-in ceilings as accessible. The term “other effective means” is vague and not conducive to interpretation. The revised definition is clear and concise.

Submitter Information Verification

Submitter Full Name: David Hittinger
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Affilliation: Independent Electrical Contractors Codes and Standard
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City:
State:
Zip:
Submittal Date: Fri Jun 09 20:31:06 EDT 2017

Public Input No. 43-NFPA 70-2017 [Definition: Accessible (as applied to equipment).]

Accessible (as applied to equipment).

Admitting close approach; not guarded by ~~locked doors~~ obstacles , elevation, or other effective means.

(CMP-1)

Statement of Problem and Substantiation for Public Input

The 2017 edition of the NFC added an Informational note and language to the definition of Accessible, Readily that the use of a key is not considered a tool. The requirements for ready access are more stringent than that what is required by the definition of accessible as applied to equipment. The proposed change removes the "not guarded by locked doors" requirement from the definition of accessible as applied to equipment because the requirement no longer applies to the definition. 110.26(F) also states that equipment rooms and enclosures housing electrical apparatus that are controlled by locks are accessible, and this code language is in conflict with the current definition of accessible as applied to equipment.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 41-NFPA 70-2017 [Section No. 110.26(F)]	PI-41 proposes a change to "shall be considered readily accessible"

Submitter Information Verification

Submitter Full Name: Brian Baughman
Organization: Generac Power Systems Inc
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jan 24 15:40:15 EST 2017

Public Input No. 1480-NFPA 70-2017 [Definition: Accessible, Readily (Readily Accessible).]

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.

Statement of Problem and Substantiation for Public Input

The NEC uses the terms 'and so forth' about sixty times. After 42 years teaching the NEC, I have no clue what this means. It's clearly a 'vague' description that leaves too much to the imagination of the reader. I did not submit a proposal for all sixty uses to have deleted; this should be done via correlating committee action.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 01 09:30:13 EDT 2017

Public Input No. 1605-NFPA 70-2017 [Definition: Accessible, Readily (Readily Accessible).]

Accessible, Readily (Readily Accessible).

Capable of being reached quickly with a height not to exceed 6'7" above the floor 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.

Statement of Problem and Substantiation for Public Input

Many of already use the 6'7" rule as applied in NEC 404.8 & NEC 240.24. Where we can also use this rule is in definitions. Gfci receptacles can become an unnecessary struggle with a contractor or home owner. Obviously, humans come in all different sizes and what can be reached quickly can differ by extreme lengths. Adding this language will offer specific direction

Submitter Information Verification

Submitter Full Name: James Dorsey
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Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 02 10:04:20 EDT 2017

Public Input No. 1783-NFPA 70-2017 [Definition: Accessible, Readily (Readily Accessible).]

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~~ to reach higher than 2 meters (six feet, six inches), or to reach past an obstruction deeper than 600 mm (two feet) . (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.

Statement of Problem and Substantiation for Public Input

1) There might be disagreement about the need to use portable ladders, because equipment that high may be reachable. However, to many it will not be safely manipulable. Therefore, operationalizing the height seems prudent.

2) Reaching past obstructions similarly can impair our ability to deal with equipment safely. Two feet seems to be a conservative, but not overly conservative limit to set.

3) "and so forth" would seem to fall under the NEC Style Manual Section 3.2.1 as a possibly unenforceable and vague term. "Similar" is among the examples given in the Style Manual, and it carries no less specificity than does "and so forth." There is nothing to prevent jurisdictions from adding other specific aspects to the definition, if additional characteristics seem important to them.

Submitter Information Verification

Submitter Full Name: David Shapiro
Organization: Safety First Electrical
Street Address:
City:
State:
Zip:
Submittal Date: Fri Aug 04 16:13:24 EDT 2017

Public Input No. 2992-NFPA 70-2017 [Definition: Accessible, Readily (Readily Accessible).]

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 crawl 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.

Statement of Problem and Substantiation for Public Input

The word crawl should have been added.

Submitter Information Verification

Submitter Full Name: Lorenzo Adam
Organization: City Of Mason
Street Address:
City:
State:
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Submittal Date: Wed Aug 30 13:16:33 EDT 2017

Public Input No. 3552-NFPA 70-2017 [Definition: Accessible, Readily (Readily Accessible).]

Accessible, Readily (Readily Accessible).

Capable from the utilization point of being reached ~~quickly~~ within 15 seconds 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 ~~,~~ or to remove obstacles, or to resort to portable ladders or to permanent stairways between floor levels having six risers or more , 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.

Statement of Problem and Substantiation for Public Input

"Quickly" is an unenforceable and vague term, and is contrary to 3.2.1 of the 2015 NEC® Style Manual. "Quickly" is no more definitive than "easily", "firmly", or "lightly" already on the Table 3.2.1 list of unenforceable terms. The term "quickly" is used nowhere else within the NEC®.

By contrast, the definition for "In Sight From" ("Within Sight From") specifies an enforceably quantifiable and explicit maximum of 15 m (50 ft). Under a similar assumption of 15 walking paces at 1 second per pace, "readily accessible" would be reached within an enforceably definitive 15 seconds. (If CMP-1 wishes to use a different time value of quick duration other than 15 seconds, this would still meet my intent.)

Similar to the hindrance of using a portable ladder, the change of elevation presented by the change of floor levels and the consequent use of many stairs represents another time element that refutes the present definition's "capable of being reached quickly" that differentiates "Readily Accessible" from the definition for "Accessible (as applied to equipment)". [The stairwway have six or more risers was lifted from NEC® 210.70(A)(2)(3).]

Further, without a definitive starting point for measuring "quickly" or "within 15 seconds", the defined term is unenforceably vague. If it were the intent that such access were merely clear directly in front of the point of operation, renewal and inspection, then a requirement for open clear space could be addressed by the wording of 110.26(B). It is however the PATHWAY from the utilization point to the operation/renewal/inspection point that must be capable of being PASSED THROUGH quickly to REACH that operation/renewal/inspection point.

Submitter Information Verification

Submitter Full Name: Brian Rock
Organization: Hubbell Incorporated
Street Address:
City:
State:
Zip:
Submittal Date: Wed Sep 06 13:20:21 EDT 2017

Public Input No. 42-NFPA 70-2017 [Definition: Accessible, Readily (Readily Accessible).]

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 crawl

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.

Statement of Problem and Substantiation for Public Input

It is grammatically incorrect to state to "climb under" when climb is defined as literally going up. Technically you crawl under an object. The revision will provide clarity of the definition.

Submitter Information Verification

Submitter Full Name: Derrick Atkins
Organization:
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City:
State:
Zip:
Submittal Date: Tue Jan 24 15:36:08 EST 2017

Public Input No. 3416-NFPA 70-2017 [Definition: Automatic.]

Automatic.

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

Availability.

The percentage of time that a system is available to perform its function(s)

Statement of Problem and Substantiation for Public Input

The availability of a power system is its essential characteristic. Everything we do in the power industry is focused on making sure that power is available because of the linkage between public safety and safe and available electrical power.. This definition, coupled with the tern "reliable" should track explicitly in the NEC and should raise awareness that reliability calculations are as essential as short circuit and load flow calculations. We see an expansion of this concept in Annex F.

Submitter Information Verification

Submitter Full Name:	Michael Anthony
Organization:	Standards Michigan
Affilliation:	IEEE Educational & Healthcare Facility Electrotechnology Subcommittee
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Tue Sep 05 20:55:28 EDT 2017

Public Input No. 3137-NFPA 70-2017 [Definition: Building.]

Building.

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

Additional Proposed Changes

File Name	Description	Approved
PC_1732.pdf	70_PC1732	✓

Statement of Problem and Substantiation for Public Input

NOTE: This Public Input appeared as “Reject but Hold” in Public Comment No. 1732 of the (A2016) Second Draft Report for NFPA 70 and per the Regs. at 4.4.8.3.1.

Substantiation: The existing definition does not make sense. A billboard or pole that is not attached to a building is presently defined as a building. Buildings typically have walls and a roof.

Resolution: The proposed revision of the definition of “Building” is new material that has not had public review and is a violation of sections 4.4.4.2 and 4.4.8.3 of the Regulations Governing Development of Standards. The definition is being held for the 2020 NEC development process. CMP-1 recognizes this term is defined within other NFPA Codes and Standards and thereby requests that the NEC Correlating Committee establish a Task Group to coordinate companion proposals for submission to the other Codes and Standards that include this term and definition.

Submitter Information Verification

Submitter Full Name: CMP ON NEC-P01
Organization: Code-Making Panel 1
Street Address:
City:
State:
Zip:
Submittal Date: Fri Sep 01 13:49:06 EDT 2017

Copyright Assignment

I, CMP ON NEC-P01, hereby irrevocably grant and assign to the National Fire Protection Association (NFPA) all and full rights in copyright in this Public Input (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 Input in this or another similar or derivative form is used. I hereby warrant that I am the author of this Public Input and that I have full power and authority to enter into this copyright assignment.

☑ By checking this box I affirm that I am CMP ON NEC-P01, 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. 1732-NFPA 70-2015 [Definition: Building.]

Building.

A structure that is enclosed by walls and a roof and stands alone or that is separated from adjoining structures by fire walls.

Statement of Problem and Substantiation for Public Comment

The existing definition does not make sense. A billboard or pole that is not attached to a building is presently defined as a building. Buildings typically have walls and a roof.

Related Item

First Revision No. 9-NFPA 70-2015 [Definition: Building.]

Submitter Information Verification

Submitter Full Name: Paul Dobrowsky
Organization: Innovative Technology Services
Street Address:
City:
State:
Zip:
Submittal Date: Fri Sep 25 20:13:20 EDT 2015

Committee Statement

Committee Action: Rejected but held

Resolution: The proposed revision of the definition of “Building” is new material that has not had public review and is a violation of sections 4.4.4.2 and 4.4.8.3 of the Regulations Governing Development of Standards. The definition is being held for the 2020 NEC development process. CMP-1 recognizes this term is defined within other NFPA Codes and Standards and thereby requests that the NEC Correlating Committee establish a Task Group to coordinate companion proposals for submission to the other Codes and Standards that include this term and definition.

Public Input No. 3614-NFPA 70-2017 [Definition: Building.]

Building.

~~A~~ Any structure ~~that stands alone or that is separated from adjoining structures by fire walls~~ used or intended for supporting or sheltering any use or occupancy. (CMP-1)

Statement of Problem and Substantiation for Public Input

This new language is the definition of a building from the International Building Code. The current language references a fire wall as a component that may constitute a building. The definition of a fire wall is "a fire-resistance-rated wall having protected openings, which restricts the spread of fire and extends continuously from the foundation to or through the roof, with sufficient structural stability under fire conditions to allow collapse of construction on either side without collapse of the wall". We have many structures built which have fire walls within them according to the use and occupancy. Just because we have a fire wall doesn't mean we have a separate building. The simplest form of this is that most single family dwellings have a fire wall of some type between the garage and the dwelling portion. If we apply our current language and according to 230.2, which generally states that each building can only be served by one service, we could have a possibility of having a service for the garage and a second for the dwelling portion.

On a larger scale where we have a large structure that is separated by fire walls, if a designer was to treat each fire wall separated section as a separate building, he could install several smaller services, and thereby avoid GFP or arc flash requirements. This could also lead to first responders having difficulty finding all the service points in the event of a fire.

Submitter Information Verification

Submitter Full Name: Randal Hunter
Organization: HTS
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City:
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Zip:
Submittal Date: Wed Sep 06 15:12:42 EDT 2017

Public Input No. 3806-NFPA 70-2017 [New Definition after Definition: Cable Routing Assembly.]

Certified

A process used as the basis for approval of equipment or material that recognizes either listing, labeling, or field labeling.

Statement of Problem and Substantiation for Public Input

Approval is required in 110.2 of all conductors and equipment. A basis for that approval is needed by the authority having jurisdiction. Some equipment is unique, standards are not available for some products, modifications are sometimes required to equipment after it leaves the manufacturer. This definition acknowledges a variety of methods available and generally acceptable for the approval of equipment. At this point, the NEC does not have a defined and inclusive term that covers all those options.

Submitter Information Verification

Submitter Full Name: Donald Cook
Organization: Shelby County Department of De
Affilliation: self
Street Address:
City:
State:
Zip:
Submittal Date: Wed Sep 06 22:16:52 EDT 2017

Public Input No. 3063-NFPA 70-2017 [New Part after I.]

Circuit Conductors

Circuit conductors include all ungrounded and grounded conductors. Equipment grounding conductors, grounding electrode conductors, and bonding conductors are not circuit conductors.

Statement of Problem and Substantiation for Public Input

The term circuit conductors is used in multiple places in the NEC, but there is disagreement in the industry as to whether grounded and grounding conductors should be included as part of the referenced circuit conductors.

(This is meant to be a new definition in Article 100, but it showed up in Terra as a new Part.)

Submitter Information Verification

Submitter Full Name: Christel Hunter
Organization: Cerro Wire
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 31 11:57:27 EDT 2017

Public Input No. 3623-NFPA 70-2017 [Definition: Concealed.]

Concealed.

~~Rendered inaccessible by the structure or finish of the building~~ Installed behind a barrrier . (CMP-1)

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

Statement of Problem and Substantiation for Public Input

Why does it have to be rendered inaccessible by the building finish or the structure, a barrier preventing access or exposure under normal operations should be acceptable whether or not it is part of the structure or building finish.

Submitter Information Verification

Submitter Full Name: Alfio Torrisi
Organization: Master electrician
Street Address:
City:
State:
Zip:
Submittal Date: Wed Sep 06 15:22:39 EDT 2017

Public Input No. 557-NFPA 70-2017 [New Definition after Definition: Concealed.]

TITLE OF NEW CONTENT

Conditions of Maintence and supervision

Type your content

Conditions of maintance and supevision shall include training on the hazards invoved in the task to be preformed, a written work plan including the affected sections of code, peiodic training on all applicable safety publications pertaining to such task (ie OHA 10, NFPA 70E etc.), utilization of proper protective equipment, supervision of a person qualified to judge the safe methods of acomplishing the work to being preformed, and a follow up on the work being peformed to ensure that it was done in a safe manner.

Statement of Problem and Substantiation for Public Input

As presently used in multiple sections of the code, there is no standard to define what the conditions of maintenance and supervision are, what the qualifications of the personnel doing said maintenance are or what constitutes proper supervision.
This new definition would seek to establish a common ground for this condition.
Presently, a person off the street could be hired to do said maintenance work with little or no experience and the supervision could be a boss sitting in an office.
Right now this is a subjective condition, this change would cause it to be a defined condition and therefor not relying on interpretation.

Submitter Information Verification

Submitter Full Name: Amos Lowrance
Organization: none
Affilliation: none
Street Address:
City:
State:
Zip:
Submittal Date: Mon Apr 17 22:48:47 EDT 2017

Public Input No. 1762-NFPA 70-2017 [New Definition after Definition: Cutout Box.]

TITLE OF NEW CONTENT

Damage. Harm that denigrates the practical safeguarding of people or property, or impairs electrical safety or usefulness or that has a deteriorating effect on the integrity of electrical systems, structures,component parts, equipment, raceway, or conductors.

Statement of Problem and Substantiation for Public Input

The definition of what constitutes damage has been debated in Code Panel Meetings and at the TCC. Is damage physical, mechanical, chemical, structural; is damage caused by neglect, improper installation, or maybe a quality installation is left unprotected or placed in a location where damage is likely to occur? Damage is not limited to conductors or cables in Section 300.4, nor overcurrent devices in 240.24(C) that may require protection, or even raceways in Chapter 3. When it comes to electrical installations, damage is a universal issue that warrants a definition. A companion proposal will be submitted to place a general requirement for protection from damage in Article 110, NEW Section 110.29. Good code is clear, understandable, fair, and enforceable.

Submitter Information Verification

Submitter Full Name: Michael Weitzel
Organization:
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 03 20:52:31 EDT 2017

Public Input No. 1431-NFPA 70-2017 [Definition: Dwelling, Multifamily.]

Dwelling, Multifamily.

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

Statement of Problem and Substantiation for Public Input

this make it clear you can have a multi-family in multi functional building

Submitter Information Verification

Submitter Full Name: Alfio Torrisi
Organization: master electrician
Street Address:
City:
State:
Zip:
Submittal Date: Sat Jul 29 09:13:25 EDT 2017

Public Input No. 574-NFPA 70-2017 [New Definition after Definition: Energized.]

Engineering Supervision

Performed by, or under the direct supervision of a licensed professional engineer or other qualified persons engaged primarily in the design, installation, or maintenance of electrical systems

Statement of Problem and Substantiation for Public Input

The term "engineering supervision" is used approximately 34 times throughout the code, but what does it really mean? Can any one perform the complicated ampacity calculations required in 310.15(C) for example? Or should these be performed by an engineer? What about using cords in hazardous locations as permitted by section 501.140(A)(2)? Would it be ok to allow the janitor to "supervise" these locations? What about grounding and bonding of fences in accordance with 250.194(A)? It would be imperative to have these installations and calculations supervised by a licensed professional engineer. This definition will help give guidance as to the qualifications needed in order to be considered properly installed under "engineering supervision".

Submitter Information Verification

Submitter Full Name: Russ Leblanc
Organization: Leblanc Consulting Services
Street Address:
City:
State:
Zip:
Submittal Date: Sat Apr 22 10:36:52 EDT 2017

Public Input No. 3212-NFPA 70-2017 [New Article after 100]

TITLE OF NEW CONTENT

Equipotential Plane. An area where wire mesh or other conductive elements are on, embedded in, or placed under the walk surface within 75 mm (3 in.), bonded to all metal structures and fixed nonelectrical equipment that may become energized, and connected to the electrical grounding system to prevent a difference in voltage from developing within the plane

Statement of Problem and Substantiation for Public Input

Move the definition for Equipotential Plane from 682.2 and 547.2 to Article 100 of the NEC. The NEC Style Manual states at 2.2.2.1 that Article 100 shall contain definitions of terms that appear in two or more articles of the NEC.

This request has been sent to the CMPs that oversee Article 682 and Article 547. Thy were asked to review the wording of both definitions and develop language that is the same before moving to Article 100. The definitions as they appear in the two articles are included below.

Article 682: Equipotential Plane. An area where wire mesh or other conductive elements are on, embedded in, or placed under the walk surface within 75 mm (3 in.), bonded to all metal structures and fixed nonelectrical equipment that may become energized, and connected to the electrical grounding system to prevent a difference in voltage from developing within the plane.

Article 547: Equipotential Plane. 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 may 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.

This definition seems to be saying the same thing but differently worded. This introduces confusion into the NEC. Since this appears in the definitions of Article 682 and Article 547 and reads practically the same, it should be relocated to Article 100. This would bring clarity to the NEC as it relates to the usage of the term equipotential plane. This would also have application for Article 680.

Submitter Information Verification

Submitter Full Name: Joseph Wages
Organization:
Street Address:
City:
State:
Zip:
Submittal Date: Mon Sep 04 08:51:09 EDT 2017

Public Input No. 15-NFPA 70-2017 [New Article after 100]

Exclusive Control (as applied to the installation of eletrical equipment).

The party responsible for the installation, maintaining, and reparing of the electrical equipment in question.

Statement of Problem and Substantiation for Public Input

The term exclusive control is used in Articles 90.2(B)(4), 90.2(B)(5), 230.66 Exception, and 230.82(9). The NFPA rules require any term used in more than one code article to be defined by the appropriate code making panel. There are many meter-mounted accessories that are listed to be under the exclusive control of the serving utility, like meter mounted transfer switches. Due to the term exclusive control not being defined, it creates confusion on who is permitted to provide, install, or maintain the equipment in question.

An NFPA staff opinion to a Technical question that I submitted stated that exclusive control could be defined as the party who is responsible for the installation, maintaining, and repairing the equipment in question and this definition is appropriate. Additionally CMP-4 partially defined the term "exclusive control" in the Second Correlating Revision No. 61-NFPA 70-2016, and the exception states that the equipment has to be supplied by an electric utility.

Submitter Information Verification

Submitter Full Name: Brian Baughman
Organization: Generac Power Systems Inc
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jan 20 15:24:25 EST 2017

Public Input No. 3636-NFPA 70-2017 [Definition: Exposed (as applied to wiring methods).]

Exposed (as applied to wiring methods).

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

Statement of Problem and Substantiation for Public Input

If it is behind a barrier, even if the barrier is designed to allow access, it is not exposed.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3623-NFPA 70-2017 [Definition: Concealed.]	

Submitter Information Verification

Submitter Full Name: Alfio Torrisi
Organization: Master electrician
Street Address:
City:
State:
Zip:
Submittal Date: Wed Sep 06 15:45:37 EDT 2017

Public Input No. 2695-NFPA 70-2017 [Definition: Field Evaluation Body (FEB).]

Field Evaluation Body (FEB).

An organization or part of an organization that performs field evaluations of electrical or other equipment. [**790,** 2012] (CMP-1)

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

Statement of Problem and Substantiation for Public Input

The term “Field Evaluation Body (FEB)" and the accompanying definition may not be clear to many users of the NEC document. A new informational note will add clarity to those unfamiliar with the term and can guide the user to another resource for additional information. Simply having the extracted text “[790, 2012]” after the definition may not provide enough information to the reader who may be wondering who determines the qualifications of an FEB. Many AHJs believe that establishing FEB credentials are part of the OSHA NRTL program and that a field evaluation is basically a mobile listing service.

This Public Input is submitted on behalf of UL’s Electrical Council.

Submitter Information Verification

Submitter Full Name: Robert Osborne
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Fri Aug 25 09:51:53 EDT 2017

Public Input No. 3414-NFPA 70-2017 [Definition: Field Evaluation Body (FEB).]

Field Evaluation Body (FEB).

An organization or part of an organization that performs field evaluations of electrical or other equipment. [**790,**~~2012~~ 2015] (CMP-1)

Statement of Problem and Substantiation for Public Input

Update the referenced standard to the most current edition

Submitter Information Verification

Submitter Full Name: Michael Farrell III
Organization: IBEW LU#8 Toledo,OH
Street Address:
City:
State:
Zip:
Submittal Date: Tue Sep 05 20:52:39 EDT 2017

Public Input No. 628-NFPA 70-2017 [Definition: Field Labeled (as applied to evaluated products...]

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. [NFPA 790-2018] (CMP-1)

Statement of Problem and Substantiation for Public Input

This definition is extracted text from NFPA 790. The action by the Code panel to not have the bracketed reference based on Public Comment 917, which was to add the extracted reference notation, was incorrect. The second draft panel statement that "The definition is no longer extracted" is incorrect and is not technical substantiation for the action taken by the panel. Extracted text is required to be identified by the NFPA Manual of Style clause 2.3.2.10 and the NFPA policy document on extracted text used in other documents.. The below copied text from NFPA 790 2014 and the 2017 NEC show this to be exactly the same text.
NFPA 790 (2014 edition)

3.3.6 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.

2017 NEC

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. (CMP-1)

It should be noted that for the 2020 NEC, the reference to NFPA 790 should be the 2018 edition as submitted in this public input.

Submitter Information Verification

Submitter Full Name: Charles Mello
Organization: cdcmello Consulting Llc
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 01 13:24:19 EDT 2017

Public Input No. 2595-NFPA 70-2017 [New Definition after Definition: Festoon Lighting.]

TITLE OF NEW CONTENT

Field Evaluation. The process used to determine conformance with requirements for one-of-a-kind, limited production, used, or modified products that are not listed or field labeled under a certification program. [790, 2018, 3.3.3]

Statement of Problem and Substantiation for Public Input

This public input is to add the definition of “Field Evaluation” to Article 100 of the NEC. The term “field labeled” was introduced in the 2017 NEC where the correct term should have been “field evaluation”. The term “field evaluation” as extracted from NFPA 790 – 2018 and is being added to Article 100 to provide the definition of that term as being used in text. In accordance with the NEC Style Manual paragraph 2.2.2.1 the correct location for this definition is in Article 100 since it is being used in multiple Articles in the NEC. Related public inputs are being made to 110.3 and the various locations in the 2017 NEC where the term “field labeled” was used.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2614-NFPA 70-2017 [New Section after 110.3(C)]	
Public Input No. 2600-NFPA 70-2017 [Section No. 230.66]	
Public Input No. 2601-NFPA 70-2017 [Section No. 690.4(B)]	
Public Input No. 2602-NFPA 70-2017 [Section No. 690.12(B)(2)]	
Public Input No. 2604-NFPA 70-2017 [Section No. 692.6]	
Public Input No. 2605-NFPA 70-2017 [Section No. 694.7(B)]	
Public Input No. 2607-NFPA 70-2017 [Section No. 694.7(F)]	
Public Input No. 2608-NFPA 70-2017 [Section No. 705.6]	
Public Input No. 2610-NFPA 70-2017 [Section No. 705.170]	
Public Input No. 2611-NFPA 70-2017 [Section No. 710.6]	
Public Input No. 2612-NFPA 70-2017 [Section No. 691.5]	

Submitter Information Verification

Submitter Full Name: Charles Mello
Organization: Cdcmello Consulting Llc
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 21 13:32:09 EDT 2017

Public Input No. 3720-NFPA 70-2017 [New Part after I.]

Field Evaluation. **The process used to determine conformance with requirements for one-of-a-kind, limited production, used, or modified products that are not listed or field labeled under a certification program.**

Statement of Problem and Substantiation for Public Input

The 2017 NEC introduced the terms Field Evaluation Body and Field Labeled. Both are commonly used in conjunction with the term Field Evaluation. By adding this definition, it will complement the two existing terms and provide clarity for the new proposed 110.3(D) section if accepted by the CMP.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3714-NFPA 70-2017 [New Section after 110.3]	Definition

Submitter Information Verification

Submitter Full Name: Richard Hollander
Organization: City of Tucson
Street Address:
City:
State:
Zip:
Submittal Date: Wed Sep 06 18:19:07 EDT 2017

Public Input No. 3161-NFPA 70-2017 [Definition: Fitting.]

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 Equipment. Electrical equipment that is firmly secured to the surface on which it is mounted, and fastened in place.

Statement of Problem and Substantiation for Public Input

Electrical equipment is either fixed, portable, or mobile. Examples are microwave ovens, electrical power generators, and so forth. A generator can be fastened in place - fixed; small enough to be lifted and place in a pickup truck - portable; or mounted to a cart, trailer, or vehicle - mobile.
Fixed, portable, and mobile are all defined in Webster's Dictionary.
Mobile and Portable electrical equipment have specific definitions in Article 100 of the Code.
Fixed is not specifically defined in the Code.
Code instructors know what 'fixed' refers to, and train their apprentices as to what it means.
Fixed Electric Space Heating Equipment is addressed in Article 424.
However, many types of electrical equipment are fixed, such as motors, luminaires, transformers, etc. And, all of these pieces of electrical equipment are utilized in portable and mobile configurations.
Logic would seem to say - add a definition for fixed electrical equipment.
Or, be consistent, and delete the definitions for portable and mobile electrical equipment from the NEC.
Why? Because all three definitions are already provided in the dictionary.

Submitter Information Verification

Submitter Full Name: Michael Weitzel
Organization:
Street Address:
City:
State:
Zip:
Submittal Date: Fri Sep 01 21:03:13 EDT 2017

Public Input No. 3981-NFPA 70-2017 [Definition: Fitting.]

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.~~ A means for connecting raceway, cable or cord to an enclosure, box, or raceway system or for connecting units or sections forming structrual systems. (CMP-1)

Informational Note: Examples of fittings are; angle fitting, bushings, cable tray fittings, conduit bodies, connectors, couplings, elbows;, expansion, expansion deflection, and deflection fittings;, liquidtight conduit fittings, sealing fittings, hubs-locknuts, nipples, service-entrance heads, threadless fittings, and transition couplings.

Statement of Problem and Substantiation for Public Input

The definition of a “Fitting” was revised to be reflect the actual meaning. The proposed “Fitting” definition and informational note corresponds and expands upon the definition found in the Tri-National Standard for Safety UL514B, CSA-C22.2 No. 18.3, NMX-J-017-ANCE Conduit, Tubing, and Cable Fittings.

Submitter Information Verification

Submitter Full Name: Vince Baclawski
Organization: Nema
Street Address:
City:
State:
Zip:
Submittal Date: Thu Sep 07 11:17:16 EDT 2017

Public Input No. 421-NFPA 70-2017 [Definition: Fitting.]

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)

Informational Note: Conduit support accessories are not considered “Fittings”. Sections 300.6 and 300.6(A) require support hardware to be constructed of materials suitable for the environment for which they are to be installed.

Additional Proposed Changes

File Name	Description	Approved
2007_ROP_Raceway_Straps.PNG	Excerpt from the 2008 code cycle Report on Proposals	✓

Statement of Problem and Substantiation for Public Input

Language is needed to clarify whether or not straps used for securing and/or supporting raceways are required to be listed. XXX.6 of several articles state "'the particular conduit,' factory elbows, and associated FITTINGS shall be listed." Article 100 defines fittings as a "part of a wiring system that is intended primarily to perform a mechanical rather than an electrical function." This seems to imply that raceway supports are indeed fittings and therefore required to be listed. I then came across a 2007 Report on Proposals (from the 2008 code cycle) that indicated otherwise.

Submitter Information Verification

Submitter Full Name: Steven Gibson
Organization: Western Oklahoma JATC
Street Address:
City:
State:
Zip:
Submittal Date: Thu Mar 30 08:50:56 EDT 2017

8-5 Log #2239 NEC-P08 **Final Action: Reject**
(342.6 Exception (New))

Submitter: Donald A. Ganiere, Ottawa, IL.
Recommendation: Revise as follows:
342.6 Listing Requirements. IMC, factory elbows, and couplings, and associated fittings shall be listed.
Exception: Raceway support fittings and accessories shall not be required to be listed .
Substantiation: The Article 100 definition of "fitting" seems to include raceway supports. Many of the commonly used raceway support straps, clamps, and other items are not listed.
Panel Meeting Action: Reject
Panel Statement: Conduit support accessories are not considered "Fittings". Sections 300.6 and 300.6(A) require support hardware to be constructed of materials suitable for the environment for which they are to be installed.
Number Eligible to Vote: 12
Ballot Results: Affirmative: 12

(Note: Sequence 8-6 was not used)

9-81a Log #1677 NEC-P09 **Final Action: Reject**

Public Input No. 3078-NFPA 70-2017 [Definition: Identified (as applied to equipment).]

Identified (as applied to equipment).

Recognizable as suitable by marking, coloring, or information included in the manufacturer's literature 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 Input

There is significant debate about the word "identified" and its application within the NEC. Adding the indicated language will make it clear that marking on the product or in the information provided by the manufacturer can be used to determine if the product is suitable for the intended use.

Submitter Information Verification

Submitter Full Name: Christel Hunter
Organization: Cerro Wire
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 31 12:48:56 EDT 2017

Public Input No. 4330-NFPA 70-2017 [New Part after I.]

Independent Power Producer

An **independent power producer** (IPP) or non-utility generator (NUG) is an entity, which is not a public utility, but which owns facilities to generate electric **power** for sale to utilities and end users.

Statement of Problem and Substantiation for Public Input

The term Independent Power Producer (IPP) is used in two proposed PIs, one expanding the list of exclusions to the NEC scope in 90.2, and the other in the scope of 694 (Wind Electric Systems).
The language quoted here is from Wikipedia:
https://en.wikipedia.org/wiki/Independent_Power_Producer

If this definition is used in only one article, it should move to that article.
If used in more that one article, it should be moved to alphabetical order in Article 100.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3876-NFPA 70-2017 [Section No. 90.2(B)]	definition is used in PI
Public Input No. 3875-NFPA 70-2017 [Section No. 694.1]	definition is used in PI

Submitter Information Verification

Submitter Full Name: Robert Wills
Organization: Intergrid LLC
Affilliation: American Wind Energy Association
Street Address:
City:
State:
Zip:
Submittal Date: Thu Sep 07 21:32:58 EDT 2017

Public Input No. 1084-NFPA 70-2017 [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 (within the line of sight) and not more than 15 m (50 ft) distant from the other. (CMP-1)

Statement of Problem and Substantiation for Public Input

The reason for the change is simply clarity.

Contractors love to argue what constitutes being "visible." Sometimes they like to argue that equipment within 50-feet, but behind a corner is "visible." It is visible - but from a different location. In reality, something being "visible" simply means that it isn't hidden, or that it isn't contained by the building finish. Adding "within the line of sight" makes it perfectly clear to the contractor that the equipment must not be greater than 50-feet away, but also must be in clear view. Please keep in mind that not all building officials have an electrical background, and "visible" to them might not be the same as "visible" to us. That is also why I'm asking for the change - it leaves no room for error or misinterpretation.

Submitter Information Verification

Submitter Full Name: Nick Sasso
Organization: State of Wyoming, www.electrical-code-expert.com
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jun 28 15:29:54 EDT 2017

Public Input No. 329-NFPA 70-2017 [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~~ other equipment, building or structure, 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 Input

the requirement is also applied to buildings and structures, see section 702.12, the change to other coincides with the word "other" in the last sentence.

Submitter Information Verification

Submitter Full Name: Alfio Torrisi
Organization: Master Electrician
Street Address:
City:
State:
Zip:
Submittal Date: Sat Mar 04 13:09:28 EST 2017

Public Input No. 523-NFPA 70-2017 [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, without the use of mirrors or transparent barriers and not more than 15 m (50 ft) distant from the other.(CMP-1)

Statement of Problem and Substantiation for Public Input

it is common to see the use of transparent barriers (glass windows,doors, etc.) to meet this requirement, often this results in the travel path to be over 50 ft and with multiple variations like two rooms over but yet still visible. what is next the use of mirrors?

Submitter Information Verification

Submitter Full Name: Alfio Torrisi
Organization: master electrician
Street Address:
City:
State:
Zip:
Submittal Date: Thu Apr 13 18:15:33 EDT 2017

Public Input No. 4127-NFPA 70-2017 [New Article after 100]

Integrated Photovoltaic (PV) System.

An ac power producing unit consisting of field-assembled photovoltaic modules and other components suitable for interconnection to other sources that is normally built in standardized sizes or types or connected as a complete system and which includes design features to ensure non-interoperability with incompatible equipment, prevent improper assembly, and to limit hazards from electrical shock, overcurrent, ground faults, arc faults, and short circuits.

Statement of Problem and Substantiation for Public Input

INTRODUCTION:

Currently, PV system components are made by various manufacturers, assembled in the field in accordance with the NEC, and often require the oversight of professional engineering to ensure system safety, compatibility, reliability and performance.

Integrated PV systems would be beneficial because standardization and integration of components would ensure tighter quality control, reduce field variation, and be simpler to verify compliance with installation instructions and safety standards. A fully integrated PV solution would incorporate modules, inverters, mounting system, metering, control systems, wiring, grounding, and PV system disconnecting means. A new product definition would allow new product standards to be created and regulate acceptable conditions for their use.

The purpose of these PI's is to define a new product category – we are proposing the term "Integrated Photovoltaic (PV) Systems", and to develop code language that would regulate the use of such products. This will be a simpler approach than pursuing numerous exceptions sprinkled throughout Article 690 and 705, and will be easier for AHJ's to understand an implement. Generally speaking this would require that integrated PV systems be

- listed systems,
- suitable for interconnection,
- and subject to the interconnection requirements in Article 705

This change would treat system components as internal components subject to listing requirements and manufacturers' installation instructions, but the requirements of Article 690 that apply to individual components would generally not apply to the internal components.

SUBSTANTIATION:

A new definition is required for an emerging new product category that integrates multiple components that had previously been separately defined, developed, tested, listed, and installed. This definition would clearly state that an integrated system includes all components and wiring assemblies in the system from the array to the PV system disconnect. The system would have to be listed as a complete system, and would have to include design features that minimize the possibility of improper assembly in the field.

An integrated PV system would come in standard, finite configurations. For example, ac modules would use specific wiring harnesses that connect the modules to a monitoring and control assembly that includes a PV system disconnect. Proprietary or standardized tamper-resistant receptacles would be used to ensure that components of the system could not be installed with incompatible equipment.

This definition should be in Article 100 as the definition will be used in both Article 690 and 705.

This definition differs from a consumer grade solar kit such as a lighting where the solar panel, battery and light are part of the same factory assembly.

This definition is similar in concept to an appliance, but a PV system cannot be an appliance since it is not a utilization load. As a power source, it is important that even integrated PV systems included features to minimize hazards associated with shock, overcurrent, ground faults, arc faults, and short circuits. Incorporating all of these features into a single listed system is the best way to ensure the system meets the highest standards for safety.

New section 690.5 is proposed as a simpler approach than providing individual exceptions sprinkled throughout Article 690 and 705. While an integrated PV system would not be generally exempt from the requirements of Article 690, consolidating the requirements in a single section would make it easier for AHJ's and other users of the NEC to understand the requirements and distinctions between an integrated PV system and other types of PV systems.

690.5(A)(1) would require the entire system be listed as a system. While certain parts within the system may be interchangeable (for example, the installer may choose a 10' or a 20' wiring harness), all of the components should be identified for their purpose within the system, and must include features to prevent improper assembly or combination with incompatible equipment. This will be part of the listing and testing process.

690.5(A)(2) would require that all of the components used in the system be identified for their specific use within the system. Beyond being part of the listing, individual components need to be identified so it is clear that they are part of the system, and it is easy to identify their function within the system. The identification requirement is essential to ensuring components are used according to their listing and that components of incompatible systems are not used interchangeably.

690.5(A)(3) clarifies that the requirements pertaining to dc circuits do not apply to an integrated photovoltaic system. This is parallel to the provision for ac modules. Since integrated PV systems would meet stricter standards than ac modules alone, there is no reason to include dc circuit requirements for integrated PV systems.

690.5(A)(4) works in conjunction with 690.5(A)(2), which requires items in this list be identified as part of the system. This section clarifies that each of these components should be examined to verify that they are part of the system and approved for their application, but should not be required to meet any other requirements that do not otherwise apply to an integrated PV system. For example, an ac wiring harness between the PV system disconnect and array in an integrated PV system may use wiring methods or materials that are not otherwise specifically allowed for connections between modules, but which meet listing requirements for ampacity, safety, and durability under the conditions of use. When installed according to the product listing and instructions, such an assembly should be allowed even if it does not meet the same requirements that would be imposed on a field-built assembly of conduit and wire. While a common-sense approach to a listed system might allow this type of construction, enumerating the components will reduce confusion.

690.5(A)(5) is required to ensure that integrated PV systems are limited to applications that would not be likely to require additional levels of scrutiny or engineering review. This would prohibit the use of ballasted systems or equipment

690.5(A)(6) defines the output of the complete system as an inverter output circuit. This is different from the existing requirements for the calculation of overcurrent protection and wiring which is based on the output of individual inverters. This change acknowledges that there could be integrated control schemes that limit output current, fix maximum output current while provide flexibility on the input side (which is considered internal). This is important as a standardized architecture requires flexibility to be practical for field applications

An integrated PV system should meet the strictest requirements for rapid shutdown, and should not require field verification of functionality such as testing internal voltage of components or proximity of metallic components to the system. 690.5(B) would specify that an integrated PV system must be listed as a rapid shutdown array. It would further specify that the entire system would need to meet rapid shutdown requirements, meaning that it would not be necessary to verify compliance within components of the system. This is a stricter requirement for rapid shutdown than most other field integrated systems would have to meet.

The integrated PV system terminates at the PV system disconnecting means, which is also part of the system. Connection to another source would be per the requirements of Article 705. 690.5(D) is necessary to clarify that the integrated PV system is not exempt from other requirements, but since it is a part of a listed system there should be additional requirements and clarification of the requirements. (2) specifies that a standardized component like a PV system disconnect should clearly state whether or not it is suitable for connection to the supply side of the service disconnecting means. This will make it easier for installers and inspectors to verify compliance. (3) allows a plug or connector suitable for the application and listed as part of the system to be used as the disconnecting means for small systems. This is similar to the allowance for generators below 15kW to use a plug in place of another disconnecting means in Article 702 and 708.

690.5(D) Would require that all wiring methods between components be considered internal to the system as listed in accordance with the Integrated PV System standard. Consolidation of wiring methods, component interconnections, connector and access requirements into a product standard allows for AHJs to rely on the fact the methods with which

the system was wired are designed, listed and compliant with the article 690.31 through 690.34 requirements. For example, a wiring harness designed, constructed and listed with specific wire type, length, connectors and attachment methods that meet all requirements in article 690.31 through 690.34, could only be used in conjunction with the listed system and therefore internal to the system. See 690.5(A)(1)

690.5(E) Would require that all grounding components and methods within the integrated system be considered internal to the system as defined by the product listing standard. The product listing shall meet the requirements of article 690.43, 690.45, and 690.46. In order to ensure that the integrated pv system maintains grounding and bonding integrity, it must be connected to the premises grounding electrode system per article 690.47

690.5(F) clarifies that an integrated PV system is not exempt from the requirements of Article 705. It further clarifies that any other wiring method that would be allowed in the NEC would be allowed for interconnection. These wiring methods would not typically be a part of the listed system, but the requirements would be specified in the manufacturer's instructions. For example, the wiring between the PV system disconnect and a breaker on the load side of the main service disconnect would be field installed conventional wiring methods such as conduit and wire connected to a breaker. The breaker would be sized based on the output of the system, which is defined for the system, and not the individual components of the system.

A new exception at 705.70 would limit the requirement for an equipment disconnect or isolating means at an AC module that is part of an integrated PV system. Other methods could be provided to enable serviceability of equipment in an integrated PV system, and such components would be part of the listed system. For example, it is possible that the “inverter” in an integrated PV system would not be independently serviceable, but that an entire assembly consisting of ac module, mounting components and wiring harness would be serviced or replaced as a unit. In such a system it is possible for controls to be integrated into the system to eliminate hazards, and such controls would be part of the listed system.

SUMMARY:

The definition and regulation of a new product category will allow manufacturers to develop integrated PV systems suitable for interconnection that are safer, more reliable, and easier to install. They will be less subject to field variation due to installer skill, conditions of use, and product selection. The listing for this product category will demonstrate compliance with safety requirements and make it easier for AHJ's to ensure the safety and reliability of installed equipment.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 4217-NFPA 70-2017 [New Section after 690.6]	Sister Proposal
Public Input No. 4227-NFPA 70-2017 [Section No. 705.70]	Sister Proposal

Submitter Information Verification

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Origin (from sources other than the submitter)

These proposals were written by Benjamin Wong, Dylan Benjamin, and Mark Albers from SunPower's Engineering Team.

Public Input No. 3077-NFPA 70-2017 [Definition: Labeled.]

Labeled.

Equipment or materials ~~to which has been attached a~~ with an attached 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~~ the listing organization . (CMP-1)

Statement of Problem and Substantiation for Public Input

Since the criteria for the listing organization are included in the definition for "Listed", there is no need to include them in the definition for "Labeled," and removing the extra language makes it easier to read and understand this definition.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3074-NFPA 70-2017 [Definition: Listed.]	

Submitter Information Verification

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Public Input No. 3148-NFPA 70-2017 [Definition: Labeled.]

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: When 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 will appear on the smallest unit container in which the product is packaged.

Additional Proposed Changes

File Name	Description	Approved
PC_532.pdf	70_PC532	✓

Statement of Problem and Substantiation for Public Input

NOTE: This Public Input appeared as “Reject but Hold” in Public Comment No. 532 of the (A2016) Second Draft Report for NFPA 70 and per the Regs. at 4.4.8.3.1.

Substantiation: Based on CMP1’s comment to PI 881; “Labeling of listed equipment is not possible in all cases or conditions such as if products are too small to be labeled or for some severe environmental conditions” and CMP 8’s comment to PI 895; “Some Listed products are marked or require markings on the smallest shipping package” it appears this informational note may to be necessary. Both the concerns of CMP1 and CMP 8 appear to be in agreement with the substantiation of PI 881.

By adding this informational note, it explains to an AHJ that even though a section of the NEC may require a product to be labeled, it is acceptable to have the label, symbol, or other identifying mark applied to the packaging or a tag in some instances. Without this informational note, if interpreted verbatim by the AHJ, this definition requires the label, symbol, or other identifying mark to be attached to the equipment or material. Without this informational note, AHJ’s may not accept a label that is affixed to the packaging where permitted by the certification organization.

Resolution: The inconsistent actions on Public Inputs to globally change the term “listed or labeled” to “listed and labeled” resulted in multiple inconsistencies through the NEC and created conflicts with other Codes and Standards that use the term. CMP-1 understands that the NEC Correlating Committee took action to develop a first revision that restores the NEC rules using the term listed or labeled to how those rules appeared in the 2014 edition. CMP-1 also understands that the NEC Correlating Committee has formed a Task Group to globally review the use of the term “listed or labeled” throughout the NEC and determine a simplified solution that addresses the terms listed, labeled, and their associated informational notes. The Task Group is to address the concerns and input from multiple qualified electrical testing laboratories and work toward a simple solution that resides within Article 100 and perhaps Article 110. The work of that task group is just getting started and may include proposed revisions to these existing definitions and associated informational notes. CMP-1 recognizes it is premature to incorporate the proposed revisions and informational note at this time.

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Public Comment No. 532-NFPA 70-2015 [Definition: Labeled.]

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.

Informational Note:. When 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 will appear on the smallest unit container in which the product is packaged.

Additional Proposed Changes

File Name	Description	Approved
Definition_Labeled_PC.JPG	334.6 Requires NM cable to be listed, the UL Guide Information indicates the UL Mark (Label) is on the attached tag, coil, reel, or on the smallest unit container in which the product is packaged.	
Definition_Labeled_PC_2.JPG	358.6 requires that EMT fittings are to be listed, the UL Guide Information indicates that the UL symbol is on the product and the Mark of UL is on the smallest unit container in which the product is packaged.	

Statement of Problem and Substantiation for Public Comment

Based on CMP1's comment to PI 881; "Labeling of listed equipment is not possible in all cases or conditions such as if products are too small to be labeled or for some severe environmental conditions" and CMP 8's comment to PI 895; "Some Listed products are marked or require markings on the smallest shipping package" it appears this informational note may to be necessary. Both the concerns of CMP1 and CMP 8 appear to be in agreement with the substantiation of PI 881.

By adding this informational note, it explains to an AHJ that even though a section of the NEC may require a product to be labeled, it is acceptable to have the label, symbol, or other identifying mark applied to the packaging or a tag in some instances. Without this informational note, if interpreted verbatim by the AHJ, this definition requires the label, symbol, or other identifying mark to be attached to the equipment or material. Without this informational note, AHJ's may not accept a label that is affixed to the packaging where permitted by the certification organization.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 1439-NFPA 70-2015 [Section No. 770.179]	This provides information that the label may be permitted to be on the smallest unit container in which the product is packaged.
Public Comment No. 1123-NFPA 70-2015 [Section No. 314.28(E)(1)]	Addressed CMP 8 concerns that some listed products are marked or require markings on the smallest shipping package.
Public Comment No. 1130-NFPA 70-2015 [Section No. 342.6]	Addresses concern that some listed products are marked or require markings on the smallest shipping package.
Public Comment No. 1250-NFPA 70-2015 [Section No. 422.15(A)]	This will address parts that may be to small to bear a label, symbol or identifying mark.
Public Comment No. 1251-NFPA 70-2015 [Section No. 422.50]	This will address small parts.
Public Comment No. 1131-NFPA 70-2015 [Section No. 344.6]	Addresses concern that some listed products are marked or require markings on the smallest shipping package.

Public Comment No. 1132-NFPA 70-2015 [Section No. 348.6]	Addresses concern that some listed products are marked or require markings on the smallest shipping package.
Public Comment No. 1287-NFPA 70-2015 [Section No. 600.22(A)]	This addresses the committee concern of parts that are too small to be labeled.
Public Comment No. 1289-NFPA 70-2015 [Section No. 600.23(A)]	This addresses the committee concern of parts that are too small to be labeled.
Public Comment No. 1291-NFPA 70-2015 [Section No. 600.24(A)]	This addresses the committee concern of parts that are too small to be labeled.
Public Comment No. 1294-NFPA 70-2015 [Section No. 600.42(H)]	This addresses the committee concern of parts that are too small to be labeled.
Public Comment No. 1206-NFPA 70-2015 [Section No. 353.6]	Addresses committee concern that some listed products are marked or require markings on the smallest shipping package.
Public Comment No. 1204-NFPA 70-2015 [Section No. 350.6]	Addresses committee concern of some listed products are marked or require markings on the smallest shipping package.
Public Comment No. 1205-NFPA 70-2015 [Section No. 352.6]	Addresses committee concern that some listed products are marked or require markings on the smallest shipping package.
Public Comment No. 1207-NFPA 70-2015 [Section No. 354.6]	Addresses committee concern that some listed products are marked or require markings on the smallest shipping package.
Public Comment No. 1212-NFPA 70-2015 [Section No. 356.6]	Addressed committee concern that some listed products are marked or require markings on the smallest shipping package.
Public Comment No. 1245-NFPA 70-2015 [Section No. 393.6]	This will help AHJ's understand that some small parts may not actually bear a label, that the label may be permitted on the packaging of the part.
Public Comment No. 1247-NFPA 70-2015 [Section No. 410.6]	This PC addressed the concerns of the committee in reference to parts that are too small to be labeled. Keep in mind that the definition of labeled also includes symbols and identifying marks.
Public Comment No. 1233-NFPA 70-2015 [Section No. 386.6]	Addressed committee concern that some listed products are marked or require markings on the smallest shipping package.
Public Comment No. 1214-NFPA 70-2015 [Section No. 358.6]	Addressed commit concern that some listed products are marked or require markings on the smallest shipping package.
Public Comment No. 1216-NFPA 70-2015 [Section No. 360.6]	Addressed committee concern that some listed products are marked or require markings on the smallest shipping package.
Public Comment No. 1221-NFPA 70-2015 [Section No. 362.6]	Addressed committee concern that some listed products are marked or require markings on the smallest shipping package.
Public Comment No. 1223-NFPA 70-2015 [Section No. 376.56(B)(1)]	Addressed committee concern that some listed products are marked or require markings on the smallest shipping package.
Public Comment No. 1330-NFPA 70-2015 [Sections 411.4(A), 411.4(B)]	Addresses the committed concern of parts that are too small to be labeled.
Public Comment No. 1423-NFPA 70-2015 [Section No. 725.135(A)]	Provides information that a label may be permitted on a container in which the product is packaged.
Public Comment No. 1429-NFPA 70-2015 [Section No. 760.135(A)]	Provides information that the label may be permitted on the container in which on the product is packaged.
Public Comment No. 1241-NFPA 70-2015 [Section No. 388.6]	Addressed committee concern that some listed products are marked or require markings on the smallest shipping package.
Public Comment No. 533-NFPA 70-2015 [Section No. 355.6]	Addressed committee concern that some listed products are marked or require markings on the smallest shipping package.
Public Comment No. 1333-NFPA 70-2015 [Section No. 600.3]	Addresses committee concern of parts that are too small to be labeled.
Public Comment No. 1226-NFPA 70-2015 [Section No. 378.6]	Addressed committee concerns that some listed products are marked or require markings on the smallest shipping package.

Related Item

Public Input No. 881-NFPA 70-2014 [Section No. 110.3(B)]

Public Input No. 1072-NFPA 70-2014 [Definition: Labeled.]

Submitter Information Verification

Submitter Full Name: JEFFREY FECTEAU
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Submittal Date: Thu Sep 03 20:36:54 EDT 2015

Committee Statement

Committee Action: Rejected but held

Resolution: The inconsistent actions on Public Inputs to globally change the term “listed or labeled” to “listed and labeled” resulted in multiple inconsistencies through the NEC and created conflicts with other Codes and Standards that use the term. CMP-1 understands that the NEC Correlating Committee took action to develop a first revision that restores the NEC rules using the term listed or labeled to how those rules appeared in the 2014 edition. CMP-1 also understands that the NEC Correlating Committee has formed a Task Group to globally review the use of the term “listed or labeled” throughout the NEC and determine a simplified solution that addresses the terms listed, labeled, and their associated informational notes. The Task Group is to address the concerns and input from multiple qualified electrical testing laboratories and work toward a simple solution that resides within Article 100 and perhaps Article 110. The work of that task group is just getting started and may include proposed revisions to these existing definitions and associated informational notes. CMP-1 recognizes it is premature to incorporate the proposed revisions and informational note at this time.

Public Input No. 632-NFPA 70-2017 [New Article after 100]

Layperson

One who is not a qualified person.

Statement of Problem and Substantiation for Public Input

The term unqualified person is now being used in some areas of the code, but from a legal perspective it can be ruled as an undefined term. Stating that a person is "unqualified" does not necessarily equate to the antithesis of a "Qualified Person."

We all want to avoid legal challenges whenever possible. That being said, if the CMP approves the proposed language and adds "layperson" as a defined term, then it can be applied to other sections of code as deemed necessary. Also the term "layperson" reads better than stating "other than the qualified person" or "unqualified person."

Submitter Information Verification

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Submittal Date: Mon May 01 22:30:09 EDT 2017

Public Input No. 3074-NFPA 70-2017 [Definition: Listed.]

Listed.

Equipment, materials, or services that are certified for use in electrical installations and included in a list published by an organization that

1) is acceptable to the authority having jurisdiction ~~and~~ ,

2) is concerned with evaluation of products or services, ~~that~~

3) maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and ~~whose listing states that either~~

4) provides a certification stating that 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.

Statement of Problem and Substantiation for Public Input

Certification is the process equipment and materials go through before being included in the published list. Reformatting this definition into a list format makes it easier to read and understand the various components that are required for a listed product.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3077-NFPA 70-2017 [Definition: Labeled.]	

Submitter Information Verification

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Public Input No. 524-NFPA 70-2017 [Definition: Live Parts.]

Live Parts.

~~Energized~~ Exposed energized conductive components. (CMP-1)

Statement of Problem and Substantiation for Public Input

The definition of "Live Parts" is not specific and could include insulated live parts such as a cable, that is not the correct perspective when the code uses the term "Live Parts" it is referencing exposed live parts and how to protect from the hazard. when the live parts are insulated the protection from contact is through the insulation.

Submitter Information Verification

Submitter Full Name: Alfio Torrisi
Organization: master electrician
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Submittal Date: Thu Apr 13 18:43:38 EDT 2017

Public Input No. 196-NFPA 70-2017 [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 through inadvertent or accidential contact with liquids , as in the case of a building under construction or the spillage of liquids .

(CMP-1)

Statement of Problem and Substantiation for Public Input

On the NFPA Exchange Site the question was asked "What is a wet location?" Some of the responses show that the code is not clear and unambiguous to all as it applies to what is considered an indoor wet location. The accidental spillage of a liquid, like a 5 gallon water jug being swapped out on a water cooler and saturating the floor, should not be considered an indoor wet location. The normal use of the space shall be the sole determining factor if a location is dry, damp, or wet.

Submitter Information Verification

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Submittal Date: Mon Feb 06 10:32:39 EST 2017

Public Input No. 1088-NFPA 70-2017 [Definition: Location, Wet.]

Location, Wet.

Installations underground or in concrete slabs or masonry in direct contact with the earth; in locations subject to saturation with water or other liquids, such as vehicle washing areas; and in unprotected locations exposed to weather. (CMP-1)

FPN:Products that have been investigated and Listed as suitable for Wet Location are suitable for use in these locaions. An Ingress Protection rating is not equivalent to a Wet Location rating.

Statement of Problem and Substantiation for Public Input

Increased use of Ingress protection ratings from international standards cause confusion in the market place, and can be interpreted as equivalent in performance. There is no correlation between the two rating schemes.

Submitter Information Verification

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Submittal Date: Fri Jun 30 10:16:41 EDT 2017

Public Input No. 1064-NFPA 70-2017 [New Article after 100]

Physical Damage (Subject to).

Application of a force to electrical equipment, conductors, and raceways that damages the equipment, conductors, or raceway to the point where replacement or repair of the equipment, conductor, or raceway is required.

Informational Note: Applications of force include, but are not limited to, blows or strikes that cause deformation of a metal enclourse or raceway, crushing force to metallic cable armor, and piercing or laceration of the insulation of conductors, nonmetallic cables, and flexible cables and cords.

Statement of Problem and Substantiation for Public Input

The NEC uses the term "where subject to physical damage" throughout the code, however this term is not defined and is open to interpretation by each authority having jurisdiction. The intent of the NEC is to have all terms used throughout the code to be clear and unambiguous and not subjected to multiple interpretations. Physical damage should be defined as any action that causes damage to equipment, conductors or raceways that has an adverse effect on the safe operation and use of the equipment, conductor, or raceway.

Submitter Information Verification

Submitter Full Name: Brian Baughman
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Submittal Date: Thu Jun 22 10:21:59 EDT 2017

Public Input No. 177-NFPA 70-2017 [New Definition after Definition: Photovoltaic (PV) System.]

TITLE OF NEW CONTENT Physical Damage,

Damage that may occur during normal surrounding activities

Statement of Problem and Substantiation for Public Input

the AHJ must have some reasonable anticipation of damage to occur during normal activity.

Submitter Information Verification

Submitter Full Name: Alfio Torrisi
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Submittal Date: Sun Feb 05 12:43:19 EST 2017

Public Input No. 4202-NFPA 70-2017 [Definition: Qualified Person.]

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-~~2012~~ 2018 , *Standard for Electrical Safety in the Workplace*, for electrical safety training requirements.

Statement of Problem and Substantiation for Public Input

Utilizing the most current version of NFPA 70E, the 2018 edition, will assist the user as well as make the Informational Note accurate and up to date.
The 2018 edition of NFPA 70E will be in effect at the First Draft meetings and should be updated.

Submitter Information Verification

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Submittal Date: Thu Sep 07 16:24:17 EDT 2017

Public Input No. 646-NFPA 70-2017 [Definition: Qualified Person.]

Qualified Person.

One who has skills and knowledge related to the construction and operation of the electrical equipment and electrical installations, and ~~has~~ received safety training to recognize and avoid the hazards involved, proof of which shall be made available to the AHJ upon request . (CMP-1)

Informational Note: Refer to NFPA 70E-2012, *Standard for Electrical Safety in the Workplace*, for electrical safety training requirements.

Statement of Problem and Substantiation for Public Input

In many locations, an owner is allowed under state law to perform commercial work up to a certain valuation without being licensed. They would not be able to calculate available fault current (110.24). There is nothing in the code allowing the AHJ to request information as to whether or not the owner or other person doing the electrical work is a qualified person. Speaking as an electrical inspector and certified building official, this change is desperately needed to aid us in our duties.

If the new language is accepted, it may also encourage those who do not have the prerequisite knowledge and safety training to obtain it, thereby increasing the demand for continuing education and subsequently the level of knowledge in the field. The proposed language gives the definition "teeth." There are other definitions that require an action, such as the definition of Special Permission which requires that all exceptions to NEC be given in writing.

Submitter Information Verification

Submitter Full Name: Nick Sasso
Organization: State of Wyoming
Street Address:
City:
State:
Zip:
Submittal Date: Wed May 03 22:46:38 EDT 2017

Public Input No. 2794-NFPA 70-2017 [New Part after I.]

Reconditioned Equipment that has been returned to safe and reliable service operating conditions to extend the life of the product.

Statement of Problem and Substantiation for Public Input

A definition would help Code users understand the term added in the 2017 NEC in 110.21(A)(2).

(This was meant to be a new definition for Article 100, but showed up as a new Part.)

Submitter Information Verification

Submitter Full Name: Christel Hunter
Organization: Cerro Wire
Street Address:
City:
State:
Zip:
Submittal Date: Sat Aug 26 13:46:32 EDT 2017

Public Input No. 1134-NFPA 70-2017 [New Article after 100]

TITLE OF NEW CONTENT

Please add a definition for "Securely Fastened" 'Not being able to move when normal force is applied'.

Statement of Problem and Substantiation for Public Input

I have seen many people leave lock nuts on fittings and conduit straps loose. Adding a definition for Securely Fastened should help with this.

Submitter Information Verification

Submitter Full Name: Jeff Miller
Organization: [Not Specified]
Street Address:
City:
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Submittal Date: Tue Jul 11 01:08:55 EDT 2017

Public Input No. 1665-NFPA 70-2017 [Definition: Voltage to Ground.]

Voltage- to- Ground. , Grounded Systems

For grounded ~~circuits~~ systems , the circuit 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~~ -to-ground shall be the maximum voltage between any ungrounded conductor and a grounded conductor.

Voltage-to-Ground, Ungrounded and Reference Grounded Systems

For ungrounded and reference grounded systems, the circuit voltage-to-ground shall be the maximum voltage between any two conductors . (CMP-1)

Statement of Problem and Substantiation for Public Input

Split this definition so that it covers solidly grounded, and ungrounded and reference grounded systems as identified in Article 690.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 03 12:49:22 EDT 2017

Public Input No. 3410-NFPA 70-2017 [Section No. 110.1]

110.1 Scope.

This article covers general requirements for the examination and approval, installation and use, access to and spaces about electrical conductors and equipment; enclosures intended for personnel entry; and tunnel installations.

Informational Note: See Informative Annex J for information regarding ADA accessibility design.

Informational Note 2: For additional information regarding electrical safety IEEE 3007.3 Recommended Practice for Electrical Safety in Industrial and Commercial Power Systems.

Statement of Problem and Substantiation for Public Input

The stronger the linkage between the NFPA and IEEE on electrical power technology the better. This document is one of several that replaces content in ANSI/IEEE 241 Recommended Practice for Electric Power Systems in Commercial Buildings -- the so-called “Gray Book”; and the ANSI/IEEE 141 Recommended Practice for Power Distribution for Industrial Plants -- the so-called “Red Book”; both of which are now being sunsetted and superseded by 3007.3.

IEEE 3000 Standards Collection™ is the trademarked name of the family of industrial and commercial power systems standards formerly known as IEEE Color Books. The IEEE 3000 Standards Collection overall includes the same content as the Color Books that have been referenced into previous editions of the NEC but is now organized into approximately 70 IEEE “dot” standards that cover specific technical topics.

This method of development, of capturing and quickly conveying leading practice from transactions among academic experts and practitioners into our industry, supports the NFPA International mission of eliminating death, injury, property and economic loss due to fire, electrical and related hazards. Details about this document is available at the link below:

https://standards.ieee.org/findstds/standard/3007.3-2012.html

Submitter Information Verification

Submitter Full Name: Michael Anthony
Organization: Standards Michigan
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City:
State:
Zip:
Submittal Date: Tue Sep 05 20:22:43 EDT 2017

Public Input No. 3221-NFPA 70-2017 [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 the provisions of 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) Renewal of parts or maintenance of equipment in accordance with manufacturer's instructions will not create aaditial hazard to electrical workers.

(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 Input

There are inherent hazards when working on or around electrical equipment. That's part of what every electrically qualified person accepts, and is aware of.
Installation of electrical equipment in accordance with the Code and manufacturer's instructions generally provides a reasonably safe installation for those who use or maintain electrical equipment.
However, some foreign or electrical equipment that I've had to work with has been labeled by a OSHA - Approved NRTL, and yet introduced hazards to workers when entering the enclosure.
For example, inside the enclosure of electrical UPS equipment that had 480-volt exposed bus bars sized 1/4 inch thick by 1 1/2 inch wide, and 12" tall; installed directly above an enclosed panelboard that low-voltage instrumentation technicians or plant operators require daily access to. NFPA 70E would require a qualified person to access the enclosure, even to reach inside the enclosure door and operate a circuit breaker. The end user should not have to hire electrically qualified persons to be their plant process operators. The manufacturer's design introduced a hazard, and the NRTL labeled the equipment. The equipment was procured and installed and money is on the line to get the plant operating. A formal complaint could be filed with the US Secretary of Labor and OSHA on the NRTL's labeling practices, but that could take months or years to resolve. I have within the past year seen two pieces of different equipment types of electrical equipment Approved by two different OSHA - Approved NRTL's with this issue - exposed live parts, and operator interface devices that would require ready access by non-qualified persons, installed within the same electrical enclosure.
Regulatory authorities will see this installation, and be concerned for worker safety. The manufacturer and contractor vigorously assert that the equipment is labeled by an OSHA-Approved NRTL, and asks "Where in the Code is this installation not permitted? As the AHJ, you are compelled to Approve it."
This added provision for consideration when judging electrical equipment will provide regulatory authorities additional strength within Code text to point to when exercising Section 90.4 - Enforcement.

Submitter Information Verification

Submitter Full Name: Michael Weitzel
Organization:
Street Address:
City:
State:
Zip:
Submittal Date: Mon Sep 04 12:29:17 EDT 2017

Copyright Assignment

I, Michael Weitzel, hereby irrevocably grant and assign to the National Fire Protection Association (NFPA) all and full rights in copyright in this Public Input (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 Input in this or another similar or derivative form is used. I hereby warrant that I am the author of this Public Input and that I have full power and authority to enter into this copyright assignment.

☑ By checking this box I affirm that I am Michael Weitzel, 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 Input No. 4145-NFPA 70-2017 [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 the provisions of this *Code*

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

" *NEMA Policy on Reconditioned Electrical Equipment*" provides guidelines for determining suitability of reconditioned, refurbished, or remanufactured equipment.

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

Additional Proposed Changes

File Name	Description	Approved
NFPA_70_110.3_EB.pdf	NFPA 70 110.3 proposed revision	✓

Statement of Problem and Substantiation for Public Input

Adding a reference clarifies categories and suitability of reconditioned, refurbished, or remanufactured equipment.

Submitter Information Verification

Submitter Full Name: EDWARD BYALIY
Organization: ROCKWELL AUTOMATION
Street Address:
City:
State:
Zip:
Submittal Date: Thu Sep 07 15:12:15 EDT 2017

Copyright Assignment

I, EDWARD BYALIY, hereby irrevocably grant and assign to the National Fire Protection Association (NFPA) all and full rights in copyright in this Public Input (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 Input in this or another similar or derivative form is used. I hereby warrant that I am the author of this Public Input and that I have full power and authority to enter into this copyright assignment.

☑ By checking this box I affirm that I am EDWARD BYALIY, 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 Input No. 4350-NFPA 70-2017 [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 the provisions of this *Code*

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

Informational Note No. 2:

industry standard are available for guidelines for reconditioning of equipment: PEARL EERS) Professional Electrical Apparatus Reconditioning League ELECTRICAL EQUIPMENT RECONDITIONING STANDARD for Electrical Apparatus and Equipment used in Commercial and Industrial Applications

Informational Note No 3: 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) 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 Input

Industry standards are now available for the reconditioning of electrical equipment. Professional Electrical Apparatus Reconditioning League ELECTRICAL EQUIPMENT RECONDITIONING STANDARD for Electrical Apparatus and Equipment used in Commercial and Industrial Applications.
Sine this is a newer standard this should be noted in the NEC

Submitter Information Verification

Submitter Full Name: Howard Herndon
Organization: SouthWest Electritech Service
Street Address:
City:
State:
Zip:
Submittal Date: Thu Sep 07 23:32:55 EDT 2017

Copyright Assignment

I, Howard Herndon, hereby irrevocably grant and assign to the National Fire Protection Association (NFPA) all and full rights in copyright in this Public Input (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 Input in this or another similar or derivative form is used. I hereby warrant that I am the author of this Public Input and that I have full power and authority to enter into this copyright assignment.

☑ By checking this box I affirm that I am Howard Herndon, 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 Input No. 3150-NFPA 70-2017 [Section No. 110.3(B)]

(B) Installation and Use.

Listed ~~or~~ and labeled equipment shall be installed and used in accordance with any instructions included in the listing ~~or~~ and labeling.

Additional Proposed Changes

File Name	Description	Approved
PC_531.pdf	70_PC531	✓

Statement of Problem and Substantiation for Public Input

NOTE: This Public Input appeared as “Reject but Hold” in Public Comment No. 531 of the (A2016) Second Draft Report for NFPA 70 and per the Regs. at 4.4.8.3.1.

Substantiation: UL recognizes the Correlating Committee created a global First Correlating Revision (FCR) which directed that in all locations where the term “and labeled” was added after “listed” during the First Revision Stage, the words “and labeled” after “listed” be deleted, returning to previous text. UL understands that the Correlating Committee appointed a task group to address several issues involving the use of the terms “listed” and “labeled,” most importantly, to clarify and establish a distinction between the terms “listed” and “labeled” which are often used interchangeably. UL supports the need for this task group. However, UL does not expect the work of this task group to affect the 2017 NEC regarding the issue of “listed and labeled.” As such, UL is submitting comments to request that the words “and labeled” be added in various locations throughout the Code for the reasons expressed in the public inputs UL submitted on this issue. UL believes that these revisions will address an ongoing problem that should not wait until the 2020 NEC for resolution.

Subsequent to the Public Input Code Panel Meetings, UL has discussed this issue with its Electrical Council whose membership includes many AHJs. The proposed revisions to the NEC received general support from the membership. This issue was also discussed at a NEMA – NRTLs Forum held on August 14, 2015 at NEMA Headquarters. UL reiterated its support for the proposed revisions. The NRTLs represented at the meeting voiced no objection to the proposals.

The rationale for the revision was simple, to provide information to the AHJ regarding the suitability of equipment they encounter. The mark on the product is the manufacturer’s attestation that the product is in compliance with the appropriate standard. NRTL’s conduct factory surveillance of products, surveillance is one method to validate the manufacturer’s attestation. Should a product be found not to be compliant the manufacturer has the option of removing the mark and shipping the product without the mark, or holding the shipment and bringing the product into compliance. In either case the “Listing” is not impacted, as the “listing” is created at the completion of the “original” certification of the product and indicates the authorization but not the mandate to label products. So the only true way an AHJ can determine whether the product he is seeing is compliant with the applicable standard is via a label on the product. Taking it one step further, listings change with time. It is quite possible that a “listing” has been withdrawn; however labeled product may still be available for sale. Should equipment that is labeled, but not listed, be deemed acceptable? Based on the NEC definitions, it is possible to have a product that meets the Article 100 definition of listed but the testing organization made the manufacture remove the label for a non-compliance issue.

As for the concerns of products that are too small to be labeled, the definition of labeled is not limited to an actual label, it also includes symbols, or other identifying marks. The Safety Standards which define the listing requirements do not address labeling of products as defined by Article 100. As a general rule, NRTL’s do not consider a product as being listed unless it is also labeled. The UL White Book states that “Only those products bearing the appropriate UL Mark and the company's name, trade name, trademark or other authorized identification should be considered as being covered by UL's Certification, Listing, Classification and Follow-Up Service. The UL Mark provides evidence of listing or labeling, which may be required by installation codes or standards.” Again the requirements for the UL Mark are not a Safety Standard requirement, they are a UL requirement and the only way to show that a product is UL Certified (Listed); other NRTL’s have similar requirements.

Resolution: The inconsistent actions on Public Inputs to globally change the term “listed or labeled” to “listed and labeled” resulted in multiple inconsistencies through the NEC and created conflicts with other Codes and Standards that use the term. CMP-1 understands that the NEC Correlating Committee took action to develop a first revision that restores the NEC rules using the term listed or labeled to how those rules appeared in the 2014 edition. CMP-1 also understands that the NEC Correlating Committee has formed a Task Group to globally review the use of the term “listed or labeled” throughout the NEC and determine a simplified solution that addresses the terms listed, labeled, and their associated informational notes. The Task Group is to address the concerns and input from multiple qualified electrical testing laboratories and work toward a simple solution that resides within Article 100 and perhaps Article 110. The work of that task group is just getting started and may include proposed revisions to these existing definitions and associated informational notes. CMP-1 recognizes it is premature to incorporate the proposed revisions and informational note at this time.

Submitter Information Verification

Submitter Full Name: CMP ON NEC-P01
Organization: Code-Making Panel 1
Street Address:
City:
State:
Zip:
Submittal Date: Fri Sep 01 15:23:46 EDT 2017

Public Comment No. 531-NFPA 70-2015 [Section No. 110.3(B)]

(B) Installation and Use.

~~Listed or~~ Listed and labeled equipment shall be installed and used in accordance with any instructions included in the ~~listing or~~ listing and labeling.

Additional Proposed Changes

File Name	Description	Approved
Essential_Guide_to_Product_Testing_and_Certification_NOV_2014.pdf	ETL Essential Guide to Product Testing & Certification 2014/2015 North American Edition. See document pages numbered 5, 8 and 10 where ETL requires products to bear their certification label to be considered as listed.	

Statement of Problem and Substantiation for Public Comment

UL recognizes the Correlating Committee created a global First Correlating Revision (FCR) which directed that in all locations where the term “and labeled” was added after “listed” during the First Revision Stage, the words “and labeled” after “listed” be deleted, returning to previous text. UL understands that the Correlating Committee appointed a task group to address several issues involving the use of the terms “listed” and “labeled,” most importantly, to clarify and establish a distinction between the terms “listed” and “labeled” which are often used interchangeably. UL supports the need for this task group. However, UL does not expect the work of this task group to affect the 2017 NEC regarding the issue of “listed and labeled.” As such, UL is submitting comments to request that the words “and labeled” be added in various locations throughout the Code for the reasons expressed in the public inputs UL submitted on this issue. UL believes that these revisions will address an ongoing problem that should not wait until the 2020 NEC for resolution.

Subsequent to the Public Input Code Panel Meetings, UL has discussed this issue with its Electrical Council whose membership includes many AHJs. The proposed revisions to the NEC received general support from the membership. This issue was also discussed at a NEMA – NRTLs Forum held on August 14, 2015 at NEMA Headquarters. UL reiterated its support for the proposed revisions. The NRTLs represented at the meeting voiced no objection to the proposals.

The rationale for the revision was simple, to provide information to the AHJ regarding the suitability of equipment they encounter. The mark on the product is the manufacturer’s attestation that the product is in compliance with the appropriate standard. NRTL’s conduct factory surveillance of products, surveillance is one method to validate the manufacturer’s attestation. Should a product be found not to be compliant the manufacturer has the option of removing the mark and shipping the product without the mark, or holding the shipment and bringing the product into compliance. In either case the “Listing” is not impacted, as the “listing” is created at the completion of the “original” certification of the product and indicates the authorization but not the mandate to label products. So the only true way an AHJ can determine whether the product he is seeing is compliant with the applicable standard is via a label on the product. Taking it one step further, listings change with time. It is quite possible that a “listing” has been withdrawn; however labeled product may still be available for sale. Should equipment that is labeled, but not listed, be deemed acceptable? Based on the NEC definitions, it is possible to have a product that meets the Article 100 definition of listed but the testing organization made the manufacture remove the label for a non-compliance issue.

As for the concerns of products that are too small to be labeled, the definition of labeled is not limited to an actual label, it also includes symbols, or other identifying marks. The Safety Standards which define the listing requirements do not address labeling of products as defined by Article 100. As a general rule, NRTL’s do not consider a product as being listed unless it is also labeled. The UL White Book states that “Only those products bearing the appropriate UL Mark and the company's name, trade name, trademark or other authorized identification should be considered as being covered by UL's Certification, Listing, Classification and Follow-Up Service. The UL Mark provides evidence of listing or labeling, which may be required by installation codes or standards.” Again the requirements for the UL Mark are not a

Safety Standard requirement, they are a UL requirement and the only way to show that a product is UL Certified (Listed); other NRTL's have similar requirements.

Related Item

Public Input No. 881-NFPA 70-2014 [Section No. 110.3(B)]

Public Input No. 1072-NFPA 70-2014 [Definition: Labeled.]

Submitter Information Verification

Submitter Full Name: JEFFREY FECTEAU
Organization: UNDERWRITERS LABORATORIES LLC
Affilliation: UL
Street Address:
City:
State:
Zip:
Submittal Date: Thu Sep 03 20:21:39 EDT 2015

Committee Statement

Committee Action: Rejected but held

Resolution: The inconsistent actions on Public Inputs to globally change the term "listed or labeled" to "listed and labeled" resulted in multiple inconsistencies through the NEC and created conflicts with other Codes and Standards that use the term. CMP-1 understands that the NEC Correlating Committee took action to develop a first revision that restores the NEC rules using the term listed or labeled to how those rules appeared in the 2014 edition. CMP-1 also understands that the NEC Correlating Committee has formed a Task Group to globally review the use of the term "listed or labeled" throughout the NEC and determine a simplified solution that addresses the terms listed, labeled, and their associated informational notes. The Task Group is to address the concerns and input from multiple qualified electrical testing laboratories and work toward a simple solution that resides within Article 100 and perhaps Article 110. The work of that task group is just getting started and may include proposed revisions to these existing definitions and associated informational notes. CMP-1 recognizes it is premature to incorporate the proposed revisions and informational note at this time.

Public Input No. 3162-NFPA 70-2017 [Section No. 110.3(B)]

(B) Installation and Use.

Listed or labeled equipment shall be installed and used in accordance with any instructions included in the listing or labeling.

Informational Note: Following manufacturer's instructions for maintenance of electrical equipment is an integral part of worker safety and industry practice toward reduction of arc-flash injuries to personnel. *See NFPA 70E-2015, Standard For Electrical Safety in the Workplace for further guidance on maintenance practices.*

Statement of Problem and Substantiation for Public Input

With a lot of talented people from all walks of life, NFPA has produced three very fine and useful documents for the electrical industry.
NFPA 70 - install the work safely;
NFPA 70E - perform the work safely; and
NFPA 70B - maintain the equipment safely.
These three documents are similar to three legs on a stool, and all are equally important.
Safety professionals have proven that properly maintained electrical equipment greatly improves worker safety. For example, overcurrent devices that have not been maintained in accordance with the manufacturer's instructions and NFPA 70E have exploded when a worker tried to operate them, and caused fatalities.
Simple things such as enclosure covers and doors not properly secured and fastened in place have become projectiles with human beings in their path, and severe injuries to personnel have occurred. Switch mechanisms that have endured heavy use may require lubrication, tightening, or adjustment, or contain broken parts, so that only the switch blades for two of three phases actually open, and one phase of the switch is still open, and the load side of the switch is still energized.
The addition of this new Informational Note will be useful if it causes even one electrical worker to pay attention as to how electrical equipment that they work on is maintained, and if not, to stop work, avoid a hazard, and speak with their supervision.

Submitter Information Verification

Submitter Full Name: Michael Weitzel
Organization:
Street Address:
City:
State:
Zip:
Submittal Date: Fri Sep 01 21:28:11 EDT 2017

Public Input No. 3201-NFPA 70-2017 [Section No. 110.3(B)]

(B) Installation ~~and Use.~~

Listed or labeled equipment shall be installed ~~and used~~ in accordance with ~~any instructions included in the listing or labeling.~~ manufacterer's installation requirements

Statement of Problem and Substantiation for Public Input

As written, 110.3(B) is not enforceable or even able to be complied with. The "...instructions included in the listing or labeling" are only available to the manufacturer and the Nationally Recognized Testing Laboratory (NRTL). Many AHJs utilize the UL White book to determine compliance with this section (for UL listings only). Some AHJs interpret this to mean any information on a manufacturer's website. j

110.3(B) currently includes the word "use," but use is outside the scope of this Code. This Code is for installations.

Submitter Information Verification

Submitter Full Name: Eric Stromberg
Organization: Los Alamos National Laboratory
Affilliation: Self
Street Address:
City:
State:
Zip:
Submittal Date: Sun Sep 03 18:29:56 EDT 2017

Public Input No. 3727-NFPA 70-2017 [Section No. 110.3(C)]

(C) Listing.

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 No 1 : 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.

Informational Note No. 2: Informative Annex A contains a list of product safety standards about which c *ode* requirements have been based.

Statement of Problem and Substantiation for Public Input

Section 110.3(C) is a new requirement for 2017 stating listing shall be in accordance with applicable product standards. Adding a new Informational Note will advise the user of a way to identify product standards that have already been determined as aligning with code requirements.

Submitter Information Verification

Submitter Full Name: Richard Hollander
Organization: City of Tucson
Street Address:
City:
State:
Zip:
Submittal Date: Wed Sep 06 18:36:27 EDT 2017

Public Input No. 2614-NFPA 70-2017 [New Section after 110.3(C)]

TITLE OF NEW CONTENT

(D) Field Evaluations. Field Evaluations shall be performed by recognized qualified electrical Field Evaluation Bodies (FEB) and shall be completed in accordance with applicable product standards recognized as achieving equivalent and effective safety for equipment installed to comply with this *Code*. In addition to any field evaluation label, field evaluation reports shall be provided to the FEB client and the Authority Having Jurisdiction.

Informational Note: International Accreditation Services (IAS) as well as many cities, counties and states provides recognitions of FEBs that perform field evaluations of certain products to ensure that they meet the requirements of the applicable product safety standards. These recognitions are done either from adoption and implementation of NFPA 790 or referencing NFPA 790 as criteria for qualification in local policies and procedures. If the field evaluation is done by a qualified electrical FEB program, the field applied evaluation label signifies that the evaluated product complies with the requirements of one or more appropriate product safety test standards as detailed in the accompanying engineering report.

Statement of Problem and Substantiation for Public Input

Just like recognizing suitable testing laboratories for listing of products and equipment in 110.3(C), those entities conducting a field evaluation need to be recognized as having the ability to properly complete the field evaluation. This recognition should utilize the NFPA 790 standard for that recognition and the FEB should be using procedures developed using the guidance from NFPA 791. By placing this into the general requirements of the Code, wherever field evaluations are indicated as an alternative or where any AHJ allows a field evaluation to be conducted, there are fundamental requirements for the AHJ to enforce and the user to rely upon. The informational note provides additional guidance and resources for the user to comply with the requirements of the section.

Submitter Information Verification

Submitter Full Name: Charles Mello
Organization: Cdcmello Consulting Llc
Street Address:
City:
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Zip:
Submittal Date: Mon Aug 21 14:52:19 EDT 2017

Public Input No. 595-NFPA 70-2017 [New Section after 110.32]

110.32(B) Clear Spaces.

Working space required by this section shall not be used for storage. When normally enclosed live parts are exposed for inpection or servicing, the working space, if in a passageway or general open space, shall be suitably guarded.

Statement of Problem and Substantiation for Public Input

The NEC presently does not address storage within the clear working space for >1000 volt conditions. The proposed text is taken verbatim from the <1000 volt - 110.26(B). OSHA does not permit storage within the required clear spaces for >600 volt.

The proposed text would make the >1000 volt requirements match the <1000 volt requirements. The proposed text would bring the NEC into conformance with OSHA 1910.303(g) and 1910.303(h).

Submitter Information Verification

Submitter Full Name: Carl Johnson II
Organization: AVCON, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Tue Apr 25 17:41:20 EDT 2017

Public Input No. 1375-NFPA 70-2017 [Section No. 110.4]

110.4 Voltages.

Throughout this *Code*, 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 Input

The deleted wording cannot be complied with for many motors. Motors are not typically rated at the nominal system voltage. For example, motors used on a system having a nominal voltage of 480 are rated at 460 volts on the nameplate. The current wording prohibits the use of most commonly used motors.

Submitter Information Verification

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Public Input No. 1485-NFPA 70-2017 [Section No. 110.4]

110.4 Voltages and Ampere .

(A) Voltage. Throughout this *Code*, 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. Unless other voltages are specified, for purposes of calculating branch-circuit and feeder loads, nominal system voltages of 120, 120/240, 208Y/120, 240, 347, 480Y/277, 480, 600Y/347, and 600 volts shall be used.

(B) Fractions of an Ampere. Calculations shall be permitted to be rounded to the nearest whole ampere, with decimal fractions smaller than 0.5 dropped.

Statement of Problem and Substantiation for Public Input

Relocate the rules related to system voltage and rounding from Article 220 Calculations [220.5(B)], to Article 110 General Requirements [110.6] so that it's clear that these requirements apply in 'general' not just to those applications contained in Article 220. For example, if one does a conductor ampacity calculation in Article 310, do the rounding rules apply? Let's make it clear that they do.

Submitter Information Verification

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Submittal Date: Tue Aug 01 10:06:01 EDT 2017

Public Input No. 3522-NFPA 70-2017 [Section No. 110.4]

110.4 Voltages.

Throughout this *Code*, except where otherwise noted, 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 or the calculated maximum voltage of a circuit to which it is connected.

Informational Note : Some direct current electrical power systems, including photovoltaic power systems and energy storage systems, operate over a wide range of voltages that can range from near zero to a significantly higher voltage (i.e. 600V, 1000V, or 1500V). The operating voltage depends on several environmental factors and internal system operating parameters and there is no nominal voltage specified for these systems. Articles 690 and 706 establish how these maximum voltages are determined and equipment requirements for these systems.

Statement of Problem and Substantiation for Public Input

Not all electrical systems have a nominal voltage and 110.4 does not address these situations. PV systems, especially in the dc circuits, do not have a nominal voltage. The operating voltage varies widely and depends on the intensity of the sunlight (irradiance), the temperatures of the PV modules, and the applied load. Calculations are used to determine the maximum voltage for each circuit and equipment is selected with a voltage rating exceeding that maximum. Energy storage systems (ESS) have dc operating voltages that are a function of the state of charge of the storage device and can vary from the low of a discharged battery to a high associated with an equalizing charge.

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Submittal Date:	Wed Sep 06 12:30:07 EDT 2017

Public Input No. 2111-NFPA 70-2017 [Section No. 110.5]

110.5 Conductors.

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

~~Informational Note: For~~

Aluminum and copper-clad aluminum conductors

~~, see 310.15 .~~

shall only be permitted where the equipment or device identification permit s installation with aluminum or coppe r-clad aluminum .

Statement of Problem and Substantiation for Public Input

The informational note reference to Section 310.15 does not actually provide any further information specific to copper-clad aluminum conductors. Therefore, the informational note does not provide guidance or value to the user and is recommended to be deleted. There are 68 uses of copper-clad aluminum in the 2017 NEC and where conductor materials are specified, copper-clad aluminum is listed right along with copper and aluminum implying any of these materials are suitable to be used within their ratings, listings of terminations, and any other limitations from that section.

There is no technical reason that copper-clad aluminum should not have the same status as copper or aluminum for general use conductors in Section 110.5 as copper-clad aluminum presently has in Tables 310.15(B)(16) through 310.15(B)(20) for conductors 2000 Volts and below, Sections 250.62, 250.102, 250.118, 310.10(H), 310.106(B), 328.100, 330.104, 334.104, 336.104 and 340.104 as well as other references in Chapters 4, 5, and 8 of the NEC.

It is noted that copper is the default conductor for terminations unless the product is identified for use with aluminum or copper-clad aluminum. The additional cautionary text in the general requirements brings forward to the Code user what is already in UL general requirements for conductor equipment and device terminations. While this allowance may enter the Code in this section, the requirements that circuit breakers, connectors, device and end use equipment would have to be identified for use with copper-clad aluminum conductors is still in place.

This Public Input is one of 19 being submitted for consideration in the 2020 NEC cycle to expand the potential use of copper-clad aluminum conductors

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2110-NFPA 70-2017 [Definition: Copper-Clad Aluminum Conductors.]	
Public Input No. 3174-NFPA 70-2017 [Section No. 310.15(B)(7)]	

Submitter Information Verification

Submitter Full Name: Peter Graser
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Submittal Date: Thu Aug 10 19:21:10 EDT 2017

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I, Peter Graser, hereby irrevocably grant and assign to the National Fire Protection Association (NFPA) all and full rights in copyright in this Public Input (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 Input in this or another similar or derivative form is used. I hereby warrant that I am the author of this Public Input and that I have full power and authority to enter into this copyright assignment.

☑ By checking this box I affirm that I am Peter Graser, 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 Input No. 3208-NFPA 70-2017 [Section No. 110.9]

110.9 Interrupting Rating.

Equipment intended to interrupt current at fault levels shall have an interrupting rating at nominal circuit voltage at least equal to the current that is available at the line terminals of the equipment.

Equipment intended to interrupt current at other than fault levels shall have an interrupting rating at nominal circuit voltage at least equal to the current that must be interrupted.

Equipment intended to interrupt current at fault levels in other than one and two family dwelling units shall have a minimum interrupting rating of 22kA.

Statement of Problem and Substantiation for Public Input

Over the last few years I have seen many situations in which installers are cited by an electrical inspector for violations of section 110.9. Each of these deals with available fault currents that are in excess of 10 kA but under 22 kA.There is no practical reason to not require 22 kA rated overcurrent protective devices. There will not be a financial burden.This public input excludes one and two family dwellings because I have not seen any issues with violations of 110.9 in dwelling units. This proposed change will establish a minimum interrupting rating for other than dwelling units to help address 110.9 violations. The availability of straight rating 22kA interrupting and series rated systems makes it very easy and inexpensive for the electrical contractor to meet this requirement.

Submitter Information Verification

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Public Input No. 3433-NFPA 70-2017 [Section No. 110.10]

110.10 Circuit Impedance, Short-Circuit Current Ratings, Reliability and Other Characteristics.

The overcurrent protective devices, the total impedance, the equipment short-circuit current ratings, and other characteristics of the circuit to be protected shall be selected and coordinated to permit the circuit protective devices used to clear a fault to do so without extensive damage to the electrical equipment of the circuit. This fault shall be assumed to be either between two or more of the circuit conductors or between any circuit conductor and the equipment grounding conductor(s) permitted in 250.118. Listed equipment applied in accordance with their listing shall be considered to meet the requirements of this section.

Informational Note: System reliability is an essential characteristic of a power system. System grounding through an impedance that is now permitted in Section 250.36 will yield an early warning signal that a power delivery component is about to fail and thereby reduce the frequency of use of the second source. The impedance grounded system will, in most cases, permit the system to deliver power until a scheduled outage thereby reducing risk to occupants. Impedance grounded systems also reduce incident energy exposure by dramatically by diverting fault current through a resistor. With incident energy reduced, maintenance may be undertaken more safely reducing the risk of more forced outages.

Statement of Problem and Substantiation for Public Input

This proposal is another in a series to raise the visibility of system reliability as an essential characteristic and to convey information about how short circuit, incident energy, system grounding methods and reliability are all related.

I proposed this change during the 2017 revision cycle, which was rejected with a recommendation to propose it again for placement in Article 250 during the 2020 revision cycle. That has been done but I am placing it on the CMP-1 agenda again to support the other proposals intended to raise the level of discussion about strengthening the NEC's statements about power system reliability,

Submitter Information Verification

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Submittal Date: Wed Sep 06 07:53:52 EDT 2017

Public Input No. 1804-NFPA 70-2017 [Section No. 110.11]

110.11 Deteriorating Agents.

Unless identified for use in the operating environment, no conductors or equipment shall be located in damp or wet locations; where exposed to gases, fumes, vapors, liquids, or other agents that have a deteriorating effect on the conductors or equipment; or where exposed to excessive temperatures.

Informational Note No. 1: See 300.6 for protection against corrosion.

Informational Note No. 2: Some cleaning and lubricating compounds can cause severe deterioration of many plastic materials used for insulating and structural applications in equipment.

Informational Note No. 3: Where excessive temperatures are encountered, neoprene gasket type sealing lock-rings may fail to maintain the enclosure integrity required by 312.2.

Equipment not identified for outdoor use and equipment identified only for indoor use, such as “dry locations,” “indoor use only,” “damp locations,” or enclosure Types 1, 2, 5, 12, 12K, and/or 13, shall be protected against damage from the weather during construction.

Informational Note No. 3: See Table 110.28 for appropriate enclosure-type designations.

Informational Note No. 4: Minimum flood provisions are provided in NFPA 5000-2015 *Building Construction and Safety Code*, the *International Building Code (IBC)*, and the *International Residential Code for One- and Two-Family Dwellings (IRC)*.

Statement of Problem and Substantiation for Public Input

Due to the excessive temperatures, the neoprene gasket is cracking and losing the necessary sealing capabilities required by 312.2. The test required for this product in general, only subjects these products to 158 degrees F for 168 hours which equates to 7 days. The minimum temperature test is specified by the manufacturer and neither minimum or maximum temperature is required to be marked on the product. In the desert area, the inside ambient temperature of a 3R enclosure in direct sunlight can easily exceed 158 degrees F for more than 7 days. In the colder northern climates, how is one to determine the minimum ambient temperature this product is tested for?

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Public Input No. 3149-NFPA 70-2017 [Section No. 110.11]

110.11 Deteriorating Agents.

Unless identified for use in the operating environment, no conductors or equipment shall be located in damp or wet locations; where exposed to gases, fumes, vapors, liquids, floodwaters or other agents that have a deteriorating effect on the conductors or equipment; or where exposed to excessive temperatures.

Informational Note No. 1: See 300.6 for protection against corrosion.

Informational Note No. 2: Some cleaning and lubricating compounds can cause severe deterioration of many plastic materials used for insulating and structural applications in equipment.

Equipment not identified for outdoor use and equipment identified only for indoor use, such as “dry locations,” “indoor use only,” “damp locations,” or enclosure Types 1, 2, 5, 12, 12K, and/or 13, shall be protected against damage from the weather during construction.

Informational Note No. 3: See Table 110.28 for appropriate enclosure-type designations.

Informational Note No. 4: Minimum ~~flood provisions are~~ provisions for resisting floodwaters and flood forces are provided in NFPA 5000-2015 *Building Construction and Safety Code* , the *International Building Code (IBC)* , and the *International Residential Code for One- and Two-Family Dwellings (IRC)* .

Statement of Problem and Substantiation for Public Input

Article 110.11, Deteriorating Agents, provides that no conductors or equipment be located in damp or wet locations or where exposed to deteriorating agents or excessive temperatures. Specific examples of deteriorating agents are included to clarify the article’s intent. While not all deteriorating agents that can damage conductors and equipment can, or should, be listed in Article 110.11, the risk of flooding to electrical equipment warrants the inclusion of “floodwaters.” Vulnerability of electrical equipment to floodwater-induced damage is well documented, and the scale of equipment damage from floodwater illustrates the pervasiveness of at-risk installations and the need for further clarification.

Water can have devastating effects on conductors and equipment. In their guidance document titled Evaluating Water-Damaged Electrical Equipment, the National Electrical Manufacturers Association (NEMA) describes damage that can occur to electrical equipment when exposed to water. Floodwaters, which are often contaminated with chemicals, sewage, oil, and other debris, can be particularly damaging. The conductive nature of salt-laden seawater in coastal areas adds to those risks.

The 2016 edition of the NEMA publication lists 40 categories of electrical equipment and describes how exposure to water can cause damage to each of those categories. The categories include distribution equipment; motor control equipment; power equipment; transformers; conduits; tubing fittings, boxes, and wires; and cords and cable. For 26 of the 40 categories, NEMA recommends replacing all equipment that has been exposed to water. For the remaining 14 categories, equipment that has been exposed to water may be reconditioned, but only after consulting with the equipment manufacturer. Most of the equipment that may be reconditioned is either non-current-carrying (e.g., conduit and tubing) or current-carrying but insulated (e.g., wire, cable, and flexible cords). The categories of equipment that may be reconditioned also include equipment that is primarily mechanical in nature like low-voltage power circuit breakers.

Flooding is common in the United States and extremely costly. NOAA’s National Centers for Environmental Information maintains an archive of oceanic, atmospheric, and geophysical data that catalogs damages from natural hazards. From 1980 to June of 2017, the United States experienced 212 natural hazard events that caused $1 billion or more in damages. Total damages for those events exceed $1.2 trillion. The events include droughts, winter storms, high-wind events, wildfires, and floods. Of the 212 events that resulted in at least $1 billion of damages, flooding accounted for 28 (13.2 percent), and flood damages exceeded $118 billion or roughly 10 percent of the total.

The scale of flood damage losses to electrical equipment may be understood in part by analyzing Federal Emergency Management Agency (FEMA) Public Assistance grants over the past 10 years (2007 to 2017). Of the $29.4 billion in assistance to state and local governments recovering from flood events, $8.6 billion was specifically designated for public buildings, building equipment, and building contents. Conservative cost estimates for the electrical equipment portion of buildings range from 5 to 8 percent. Accordingly, U.S. floods resulted in up to $700 million of electrical equipment damage to public buildings alone over the last 10 years. Numerous FEMA post-flood building performance assessments (e.g., Hurricanes Sandy, Isaac and Midwest Floods of 2008) have concluded that damage to electrical equipment and dependent systems can be mitigated through enhanced installation.

In summary, since floods are common in the United States and result in billions of dollars of damage when floodwater

comes into contact with electrical equipment, the term “floodwater” should be added to the list of deteriorating agents in Article 110.11. The proposed edits to Informational Note 4 will further serve to raise awareness of at-risk installation by clarifying the connection between “floodwaters” and the minimum provisions found in National Fire Protection Association 5000, the International Building Code, and International Residential Code.

Submitter Information Verification

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Submittal Date: Fri Sep 01 15:22:32 EDT 2017

Public Input No. 2596-NFPA 70-2017 [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.

Exception: In industrial locations, under engineering supervision, short conduit nipple openings for wiring methods on top of electrical switchgear and motor control centers shall be permitted.

Statement of Problem and Substantiation for Public Input

Tray cables entering or exiting cable tray and switchgear and motor control center through short conduit nipples is a common practice in heavy industry. In fact, a very well respected principal member of CMP 5, Mr. Mello, formerly from UL, performed a field evaluation of this type of installation, and with proper cable support inside and outside electrical equipment, saw no safety hazard.
Duct seal was recommended to close around the cables inside the bushed conduit nipple.
Mr. Ode of UL also concurred with this assessment, and wrote an article that was published in Electrical Contractor Magazine. Mr. Ode also concurred with this practice in the aforementioned UL Field Evaluation Assessment.
Medium voltage switchgear also may be designed to direct arc incident energy upward toward the top of the equipment, and away from the electrical worker standing in front of the equipment. This type of design by the OEM greatly improves worker safety, as it directs some of the dangerous arc flash energy away from the worker, and is an already accepted practice.
Where are the limits as to how much of the enclosure may be open on top? The practice as proposed is to be limited to conduit nipple raceways in the top of the equipment.
As with any installation covered by the Code, the Electrical AHJ utilizes code rules, and exercises their judgment for Approval.

Submitter Information Verification

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Submittal Date: Mon Aug 21 13:32:23 EDT 2017

Public Input No. 259-NFPA 70-2017 [New Section after 110.12]

(C) Abandoned Wiring and Equipment

Permanent wiring and equipment abandoned in place shall be tagged or otherwise identified at termination and junction points as "Abandoned in Place" or removed from all accessible areas and insulated from contact with other energized wiring or equipment..

Statement of Problem and Substantiation for Public Input

This requirement is presently addressed in NFPA 1 section 11.1.2.3. It makes practical sense to include this requirement in the NEC. A service disconnect that gets abandoned in place could lead to real danger to emergency responders if they are unaware that the NEW service disconnect is now on the other end of the building. Imagine if during every renovation, the contractors simply left all of the old panels, meters, disconnects, pipes etc. etc. etc. in place with no way for the next person to know which equipment is abandoned and which is not!!!!! This would be a nightmare scenario and it needs to be addressed. My proposal is very similar to the requirements found in NFPA 1

Submitter Information Verification

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Submittal Date: Sat Feb 18 17:12:04 EST 2017

Public Input No. 3638-NFPA 70-2017 [New Section after 110.12]

TITLE OF NEW CONTENT

110.12 Mechanical Execution of Work.

(C) Wire Planning – Future Expansion and Convenience.

When a panelboard is installed in a location that will be concealed by building finish, a spare conduit shall be installed to junction box in an accessible area where future circuits can be routed without removing building finish.

Statement of Problem and Substantiation for Public Input

It always has been an advisory part of the code to suggest providing spare raceways for future expansion in 90.8 Wire Planning. Article 90.8 is not enforceable as a code rule even if it does contain excellent advise. Installing these words in the Code Body will provide a step towards Real Future Expansion capabilities.

Submitter Information Verification

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Submittal Date: Wed Sep 06 15:48:15 EDT 2017

Public Input No. 2909-NFPA 70-2017 [New Section after 110.12(B)]

110.12

(C) Cables and Conductors

Cables and conductors installed exposed on the surface 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/BICSI 568-2006, Standard for Installing Commercial Building Telecommunications Cabling; ANSI/ NECA/FOA 301-2009, Standard for Installing and Testing Fiber Optic Cables; and other ANSI-approved installation standards.

Informational Note No. 2: See 4.3.11.2.6.5 and 4.3.11.5.5.6 of NFPA 90A-2012, Standard for the Installation of Air-Conditioning and Ventilating Systems, for discrete combustible components installed in accordance with 300.22(C).

Informational Note No. 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 Input

This public input is developed by a Correlating Committee appointed task group to improve the usability of Chapters 7 and 8, specifically the Articles that fall under the purview of Code Making Panels 3 and 16. The task group is looking to remove redundancy within these articles.

Task group members included Chairman David Hittinger CMP 1, Larry Ayer CMP 13, Jim Dollard CMP 10-13, Ernie Gallo CMP 15, David Kendall CMP 8, George Straniero CMP 3, Charles Palmieri CMP 3, Bill McCoy CMP 16, Randy Ivans CMP 3-16, Robert Jensen CMP 16, Terry Coleman CMP 16, George Bish CMP 16.

This public input is being submitted to coordinate with the deletion of section 760.24, 770.24, 725.24, 800.24, 820.24, 830.24, and 840.24 which concerns "Mechanical Execution of Work". The requirement is repeated throughout various articles in Chapter 7 and Chapter 8 with only slight variations. Each xxx.24 section requires either adherence to 300.4 in its entirety, 300.4(D), 300.11 or a plethora of variations between these, even though the cable types are similar in construction and use. This requirement would be better suited in Article 300 or Article 110, and would provide more clarity and usability. 110.12 already covers Mechanical Execution of work.

This specific public input provide a more detailed requirement for Mechanical Execution of Work in 110.12(C) that would cover the main concepts in Chapter 7 and Chapter 8. A companion public input is being submitted to place the same information into a new section 300.23. This will allow both CMP 1 and CMP 3 to determine the best location for this requirement.

Since Article 300 sections only applies to Chapter 7 Articles when referenced companion public inputs are also being submitted to add the reference for 300.24, where appropriate in Chapter 7 articles.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3979-NFPA 70-2017 [New Section after 300.23]	
Public Input No. 2912-NFPA 70-2017 [Section No. 725.24]	
Public Input No. 2913-NFPA 70-2017 [Section No. 760.24]	
Public Input No. 2914-NFPA 70-2017 [Section No. 770.24]	

Public Input No. 2915-NFPA 70-2017 [Section No. 800.24]

Public Input No. 2916-NFPA 70-2017 [Section No. 820.24]

Public Input No. 2917-NFPA 70-2017 [Section No. 830.24]

Public Input No. 2918-NFPA 70-2017 [Section No. 840.24]

Public Input No. 3967-NFPA 70-2017 [Section No. 725.3]

Public Input No. 3971-NFPA 70-2017 [Section No. 760.3]

Public Input No. 3976-NFPA 70-2017 [Section No. 770.3]

Submitter Information Verification

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Submittal Date: Tue Aug 29 08:40:08 EDT 2017

Public Input No. 1621-NFPA 70-2017 [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~~ connected conductor(s) . 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 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.

Statement of Problem and Substantiation for Public Input

Editorial revise this section for clarity. The word “properly” is vague and unenforceable and should be avoided according to Section 3.2.1 of the NEC Style Manual. The conductor connections are already implied without stating in the sentence “installed and used.”

Submitter Information Verification

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Submittal Date: Wed Aug 02 13:08:16 EDT 2017

Public Input No. 2112-NFPA 70-2017 [Section No. 110.14 [Excluding any Sub-Sections]]

. Electrical connections shall comply with the following:

(A) Conductors. Electrical connections of conductors shall comply with the following:

(1) Connector Identification. **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~~ **(2) Dissimilar Metals.** **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 and copper-clad aluminum), unless the device is identified for the purpose and conditions of use.** ~~Materials~~ **(3) Suitability for 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. (4) Finely Stranded Conductors.**

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. **Remaining sections to be renumbered to (B) through (E).**

Additional Proposed Changes

File Name	Description	Approved
CCA_UL486C_twist_on_connector_test_at_TnB_08-09-11.pdf	486 C Test Report for CCA thermal stability and compatibility with Connecting to Cu	✓

Statement of Problem and Substantiation for Public Input

Copper-clad aluminum with the outer covering of copper does not have contact as a dissimilar metal when installed in pressure wire or pressure splicing connectors. The metal to metal contact is copper to copper. It should be noted that by its design the copper cladding on copper clad aluminum is metallurgically bonded to the aluminum core. Testing completed to UL 486C has shown that there is no issue with copper-clad aluminum being connected to copper in pressure wire and pressure splicing connectors. The prohibition for direct connection of copper to aluminum and aluminum to copper-clad aluminum as dissimilar metals is correct except where the device is listed and identified for that application. The revisions into subsections for the exiting charging paragraph into a list format improves clarity and readability for what are four different requirements. The existing sections in the 2017 NEC numbered 110.14(A) through 110.14(D) to be renumbered as 110.14(B) through 110.14(E). No technical changes intended for sections 110.14(A) through 110.14(D).

While this allowance may enter the Code in this section, the requirements that circuit breakers, connectors, device and end use equipment would have to be identified for use with copper-clad aluminum conductors is still in place.

This Public Input is one of 19 being submitted for consideration in the 2020 NEC cycle to expand the potential use of copper-clad aluminum conductors

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2111-NFPA 70-2017 [Section No. 110.5]	
Public Input No. 2110-NFPA 70-2017 [Definition: Copper-Clad Aluminum Conductors.]	

Submitter Information Verification

Submitter Full Name: Peter Graser
Organization: Copperweld
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Submittal Date: Thu Aug 10 20:20:06 EDT 2017

Copyright Assignment

I, Peter Graser, hereby irrevocably grant and assign to the National Fire Protection Association (NFPA) all and full rights in copyright in this Public Input (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 Input in this or another similar or derivative form is used. I hereby warrant that I am the author of this Public Input and that I have full power and authority to enter into this copyright assignment.

☑ By checking this box I affirm that I am Peter Graser, 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

SOUTHAVEN LABORATORY TEST REPORT

8735 Hamilton Road, Southaven, MS 38671

TO: Rodolfo Elizondo	T&B PROJECT #: HM400098	UL Project #: N/A
FACILITY: Southwind	RECEIVED: 3/31/2011	UL File #: N/A
UL 486C Fifth Edition September 7, 2004 (Revision Date: August 25, 2006)		

DESCRIPTION OF TEST SAMPLES:

Marrette 739 and 65 twist on wire connectors

DESCRIPTION/ PURPOSE OF TEST:

Performed tests per UL486C
-Clause 7.2 (Current Cycling Test)
-Clause 7.3 (Static Heating sequence)

SUMMARY:

All samples passed.

ENVIRONMENTAL STATEMENT:

Unless specified otherwise in the individual Methods, the test shall be conducted under the following environmental conditions. Confirmation of these conditions shall be recorded at the time the test is conducted.

Ambient Temp. (°C) 23± 5°C Relative Humidity (%) 50± 20% Barometric Pressure (mBar) N/A

REPORTED BY: Mike Henry/Zach Winters	DATE:	APPROVED BY: James Baker	DATE: 8-9-11

T&B Project Number: HM400098
UL Project Number: N/A
UL File Number: N/A
Sample Received Date: 2011-03-31
Sample Source: DC Canada
Catalog Number(s): 739P
Description: Twist on Wire Connectors without Oxide Inhibitor

Room Temp. (°C): 21.4
Room Humidity (%RH): 55
Test Date: 2011-06-02
Tested By (Print): Mike Henry/ Zach Winters
Witness/Approval:

Standard - NMX-J-548-ANCE-2004 • C22.2 NO. 188-04 • UL 486C (September 7, 2004)

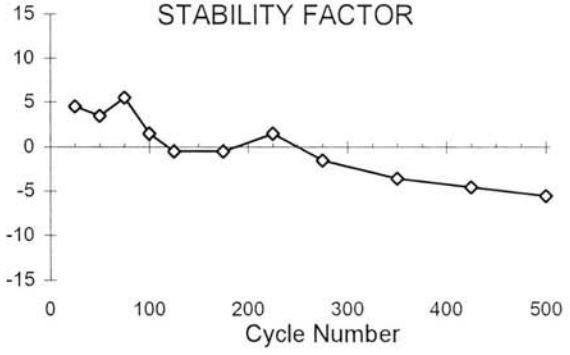
CURRENT CYCLING (CLAUSE 7.2 - September 7, 2004)

Procedure: The speciman sets per Clause 8.2 shall complete 500 cycles of equal current-on and current-off operations for the time and current specified in Table 6. Upon completion of the current-cycling test no connector shall exceed 125°C temperature rise and the stablity factor shall not exceed ±10.

Main Wire Size/Type: #12 Sol Cu, THHN or THWN, 90 deg C, 600V
Tap Wire Size/Type: #12 Sol CCA, THHN or THWN, 90 deg C, 600V
Strip Length (in.): 11/16"
Installation Tool: N/A
Die: N/A
Torque (in-lbf): 5
Number of Crimps: N/A
Cycling-Current (A): 43

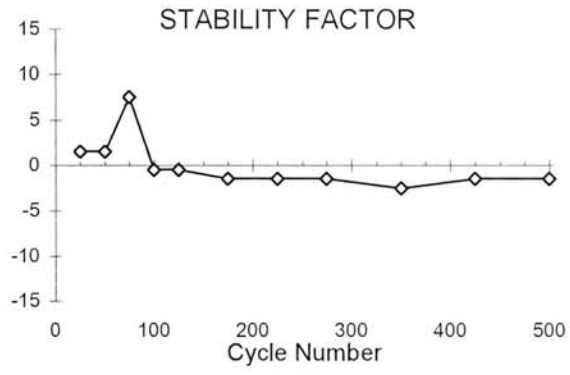
SAMPLE 9

Cycle Number	Actual (°C)	Control (°C)	Ambient (°C)	Heat Rise (°C)	Dev	"S" Factor
25	86	94	27	59	-8	4.5
50	83	92	25	58	-9	3.5
75	78	85	27	51	-7	5.5
100	83	94	27	56	-11	1.5
125	81	94	27	54	-13	-0.5
175	81	94	25	56	-13	-0.5
225	83	94	26	57	-11	1.5
275	81	95	26	55	-14	-1.5
350	79	95	26	53	-16	-3.5
425	78	95	25	53	-17	-4.5
500	76	94	25	51	-18	-5.5



SAMPLE 10

Cycle Number	Actual (°C)	Control (°C)	Ambient (°C)	Heat Rise (°C)	Dev	"S" Factor
25	85	94	27	58	-9	1.5
50	83	92	25	58	-9	1.5
75	82	85	27	55	-3	7.5
100	83	94	27	56	-11	-0.5
125	83	94	27	56	-11	-0.5
175	82	94	25	57	-12	-1.5
225	82	94	26	56	-12	-1.5
275	83	95	26	57	-12	-1.5
350	82	95	26	56	-13	-2.5
425	83	95	25	58	-12	-1.5
500	82	94	25	57	-12	-1.5



Notes: Cycle #75 the door had been left open resulting in the change of the control cable temperature.

Equip. (TFE #)	3	1656	1519	1515	3222	441	1061	519	3314		

T&B Project Number: HM400098
UL Project Number: N/A
UL File Number: N/A
Sample Received Date: 2011-03-31
Sample Source: DC Canada
Catalog Number(s): 739P
Description: Twist on Wire Connectors without Oxide Inhibitor

Room Temp. (°C): 21.4
Room Humidity (%RH): 55
Test Date: 2011-06-02
Tested By (Print): Mike Henry/ Zach Winters
Witness/Approval:

Standard - NMX-J-548-ANCE-2004 • C22.2 NO. 188-04 • UL 486C (September 7, 2004)

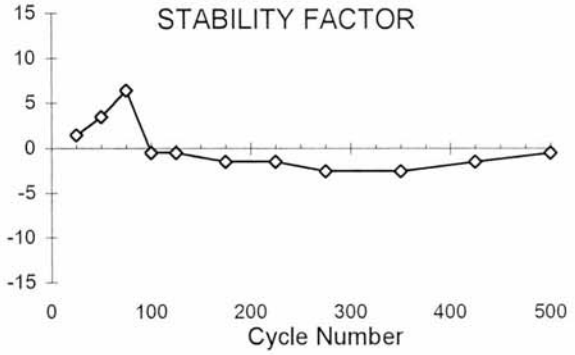
CURRENT CYCLING (CLAUSE 7.2 - September 7, 2004)

Procedure: The speciman sets per Clause 8.2 shall complete 500 cycles of equal current-on and current-off operations for the time and current specified in Table 6. Upon completion of the current-cycling test no connector shall exceed 125°C temperature rise and the stablity factor shall not exceed ±10.

Main Wire Size/Type: #12 Sol Cu, THHN or THWN, 90 deg C, 600V
Tap Wire Size/Type: #12 Sol CCA, THHN or THWN, 90 deg C, 600V
Strip Length (in.): 11/16"
Installation Tool: N/A
Die: N/A
Torque (in-lbf): 5
Number of Crimps: N/A
Cycling-Current (A): 43

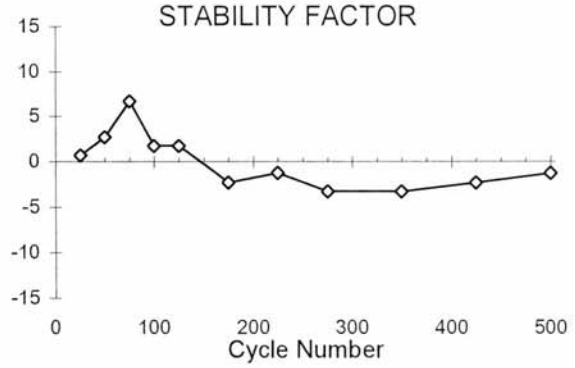
SAMPLE 11

Cycle Number	Actual (°C)	Control (°C)	Ambient (°C)	Heat Rise (°C)	Dev	"S" Factor
25	97	94	27	70	3	1.5
50	97	92	25	72	5	3.5
75	93	85	27	66	8	6.5
100	95	94	27	68	1	-0.5
125	95	94	27	68	1	-0.5
175	94	94	25	69	0	-1.5
225	94	94	26	68	0	-1.5
275	94	95	26	68	-1	-2.5
350	94	95	26	68	-1	-2.5
425	95	95	25	70	0	-1.5
500	95	94	25	70	1	-0.5



SAMPLE 12

Cycle Number	Actual (°C)	Control (°C)	Ambient (°C)	Heat Rise (°C)	Dev	"S" Factor
25	90	94	27	63	-4	0.7
50	90	92	25	65	-2	2.7
75	87	85	27	60	2	6.7
100	91	94	27	64	-3	1.7
125	91	94	27	64	-3	1.7
175	87	94	25	62	-7	-2.3
225	88	94	26	62	-6	-1.3
275	87	95	26	61	-8	-3.3
350	87	95	26	61	-8	-3.3
425	88	95	25	63	-7	-2.3
500	88	94	25	63	-6	-1.3



Notes: Cycle #75 the door had been left open resulting in the change of the control cable temperature.

Equip. (TFE #)	3	1656	1519	1515	3222	441	1061	519	3314		

T&B Project Number: HM400098
UL Project Number: N/A
UL File Number: N/A
Sample Received Date: 2011-03-31
Sample Source: DC Canada
Catalog Number(s): 65P
Description: Twist on Wire Connectors with Oxide Inhibitor

Room Temp. (°C): 21.4
Room Humidity (%RH): 55
Test Date: 2011-06-02
Tested By (Print): Mike Henry/ Zach Winters
Witness/Approval:

Standard - NMX-J-548-ANCE-2004 • C22.2 NO. 188-04 • UL 486C (September 7, 2004)

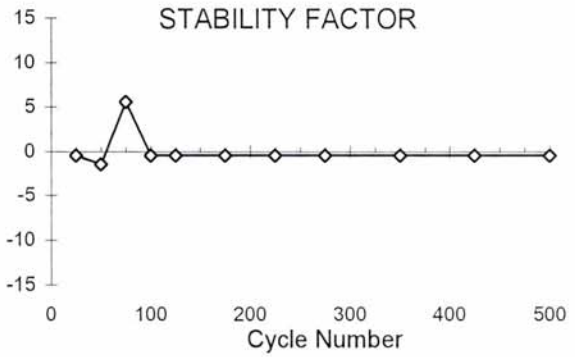
CURRENT CYCLING (CLAUSE 7.2 - September 7, 2004)

Procedure: The speciman sets per Clause 8.2 shall complete 500 cycles of equal current-on and current-off operations for the time and current specified in Table 6. Upon completion of the current-cycling test no connector shall exceed 125°C temperature rise and the stablity factor shall not exceed ±10.

Main Wire Size/Type: #12 Sol Cu, THHN or THWN, 90 deg C, 600V
Tap Wire Size/Type: #12 Sol CCA, THHN or THWN, 90 deg C, 600V
Strip Length (in.): 1/2"
Installation Tool: N/A
Die: N/A
Torque (in-lbf): 5
Number of Crimps: N/A
Cycling-Current (A): 43

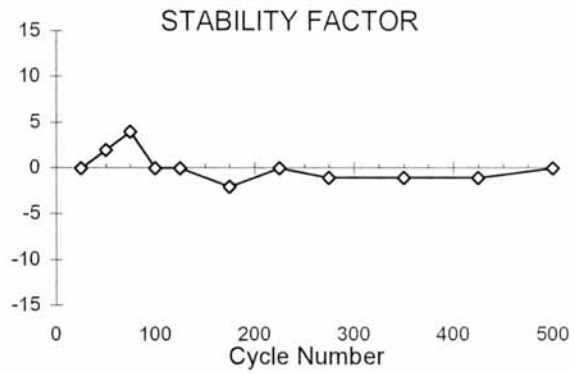
SAMPLE 25

Cycle Number	Actual (°C)	Control (°C)	Ambient (°C)	Heat Rise (°C)	Dev	"S" Factor
25	83	94	27	56	-11	-0.5
50	80	92	25	55	-12	-1.5
75	80	85	27	53	-5	5.5
100	83	94	27	56	-11	-0.5
125	83	94	27	56	-11	-0.5
175	83	94	25	58	-11	-0.5
225	83	94	26	57	-11	-0.5
275	84	95	26	58	-11	-0.5
350	83	94	25	58	-11	-0.5
425	84	95	25	59	-11	-0.5
500	83	94	25	58	-11	-0.5



SAMPLE 26

Cycle Number	Actual (°C)	Control (°C)	Ambient (°C)	Heat Rise (°C)	Dev	"S" Factor
25	83	94	27	56	-11	-0.1
50	83	92	25	58	-9	1.9
75	78	85	27	51	-7	3.9
100	83	94	27	56	-11	-0.1
125	83	94	27	56	-11	-0.1
175	81	94	25	56	-13	-2.1
225	83	94	26	57	-11	-0.1
275	83	95	26	57	-12	-1.1
350	82	94	25	57	-12	-1.1
425	83	95	25	58	-12	-1.1
500	83	94	25	58	-11	-0.1



Notes: Cycle #75 the door had been left open resulting in the change of the control cable temperature.

Equip. (TFE #)	3	1656	1519	1515	3222	441	1061	519	3314		

T&B Project Number: HM400098
UL Project Number: N/A
UL File Number: N/A
Sample Received Date: 2011-03-31
Sample Source: DC Canada
Catalog Number(s): 65P
Description: Twist on Wire Connectors with Oxide Inhibitor

Room Temp. (°C): 21.4
Room Humidity (%RH): 55
Test Date: 2011-06-02
Tested By (Print): Mike Henry/ Zach Winters
Witness/Approval:

Standard - NMX-J-548-ANCE-2004 • C22.2 NO. 188-04 • UL 486C (September 7, 2004)

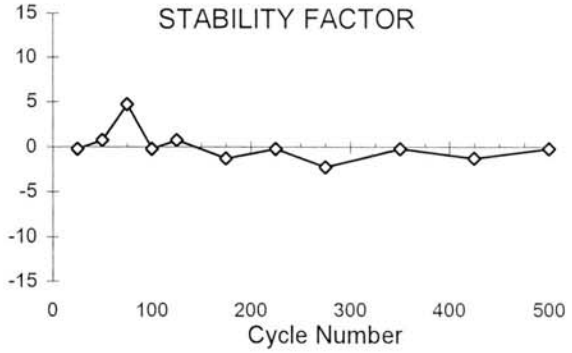
CURRENT CYCLING (CLAUSE 7.2 - September 7, 2004)

Procedure: The speciman sets per Clause 8.2 shall complete 500 cycles of equal current-on and current-off operations for the time and current specified in Table 6. Upon completion of the current-cycling test no connector shall exceed 125°C temperature rise and the stablity factor shall not exceed ±10.

Main Wire Size/Type: #12 Sol Cu, THHN or THWN, 90 deg C, 600V
Tap Wire Size/Type: #12 Sol CCA, THHN or THWN, 90 deg C, 600V
Strip Length (in.): 1/2"
Installation Tool: N/A
Die: N/A
Torque (in-lbf): 5
Number of Crimps: N/A
Cycling-Current (A): 43

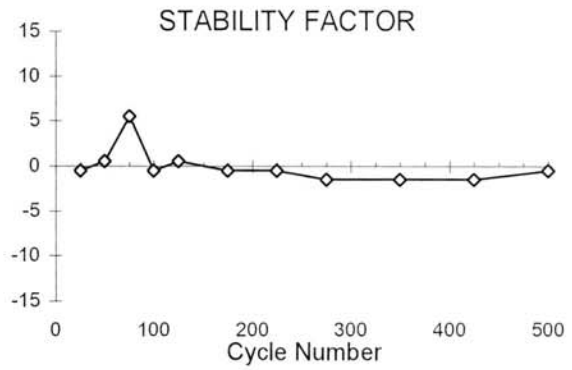
SAMPLE 27

Cycle Number	Actual (°C)	Control (°C)	Ambient (°C)	Heat Rise (°C)	Dev	"S" Factor
25	73	94	27	46	-21	-0.3
50	72	92	25	47	-20	0.7
75	69	85	27	42	-16	4.7
100	73	94	27	46	-21	-0.3
125	74	94	27	47	-20	0.7
175	72	94	25	47	-22	-1.3
225	73	94	26	47	-21	-0.3
275	72	95	26	46	-23	-2.3
350	73	94	25	48	-21	-0.3
425	73	95	25	48	-22	-1.3
500	73	94	25	48	-21	-0.3



SAMPLE 28

Cycle Number	Actual (°C)	Control (°C)	Ambient (°C)	Heat Rise (°C)	Dev	"S" Factor
25	82	94	27	55	-12	-0.5
50	81	92	25	56	-11	0.5
75	79	85	27	52	-6	5.5
100	82	94	27	55	-12	-0.5
125	83	94	27	56	-11	0.5
175	82	94	25	57	-12	-0.5
225	82	94	26	56	-12	-0.5
275	82	95	26	56	-13	-1.5
350	81	94	25	56	-13	-1.5
425	82	95	25	57	-13	-1.5
500	82	94	25	57	-12	-0.5



Notes: Cycle #75 the door had been left open resulting in the change of the control cable temperature.

Equip. (TFE #)	3	1656	1519	1515	3222	441	1061	519	3314		

T&B Project Number: HM400098
UL Project Number: N/A
UL File Number: N/A
Sample Received Date: 2011-03-31
Sample Source: DC Canada
Catalog Number(s): 739P
Description: Twist on Wire Connectors without Oxide Inhibitor

Room Temp. (°C): 21.4
Room Humidity (%RH): 55
Test Date: 2011-06-02
Tested By (Print): Mike Henry/ Zach Winters
Witness/Approval:

Standard - NMX-J-548-ANCE-2004 • C22.2 NO. 188-04 • UL 486C (September 7, 2004)

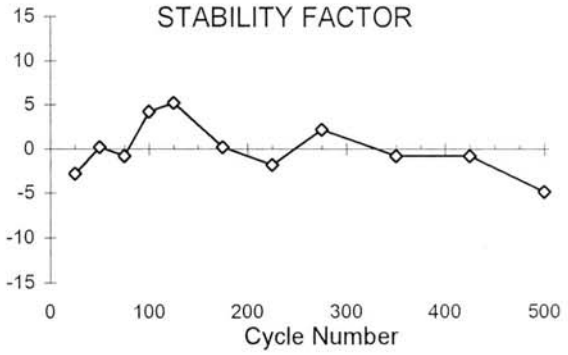
CURRENT CYCLING (CLAUSE 7.2 - September 7, 2004)

Procedure: The speciman sets per Clause 8.2 shall complete 500 cycles of equal current-on and current-off operations for the time and current specified in Table 6. Upon completion of the current-cycling test no connector shall exceed 125°C temperature rise and the stablity factor shall not exceed ±10.

Main Wire Size/Type: #10 Sol CCA, THHN or THWN, 90 deg C, 600V
Tap Wire Size/Type: #10 Sol CCA, THHN or THWN, 90 deg C, 600V
Strip Length (in.): 11/16"
Installation Tool: N/A
Die: N/A
Torque (in-lbf): 5
Number of Crimps: N/A
Cycling-Current (A): 60

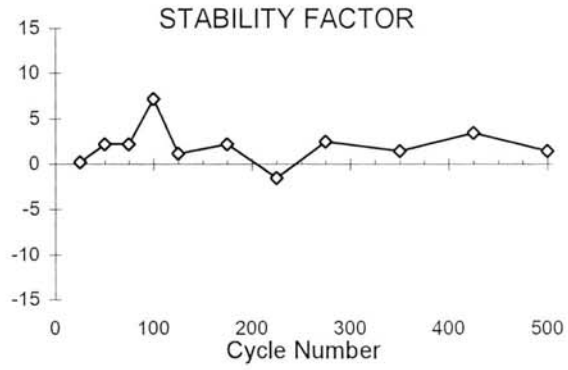
SAMPLE 13

Cycle Number	Actual (°C)	Control (°C)	Ambient (°C)	Heat Rise (°C)	Dev	"S" Factor
25	111	98	22	89	13	-2.8
50	113	97	22	91	16	0.2
75	112	97	23	89	15	-0.8
100	113	93	23	90	20	4.2
125	117	96	23	94	21	5.2
175	112	96	24	88	16	0.2
225	111	97	24	87	14	-1.8
275	112	94	24	88	18	2.2
350	111	96	24	87	15	-0.8
425	112	97	24	88	15	-0.8
500	111	100	24	87	11	-4.8



SAMPLE 14

Cycle Number	Actual (°C)	Control (°C)	Ambient (°C)	Heat Rise (°C)	Dev	"S" Factor
25	114	98	22	92	16	0.2
50	115	97	22	93	18	2.2
75	115	97	23	92	18	2.2
100	116	93	23	93	23	7.2
125	113	96	23	90	17	1.2
175	114	96	24	90	18	2.2
225	115	97	24	91	18	-1.5
275	116	94	24	92	22	2.5
350	117	96	24	93	21	1.5
425	120	97	24	96	23	3.5
500	121	100	24	97	21	1.5



Notes:

Equip. (TFE #)		37	1356	1355	1061	519	1439	3314	1656	443		

T&B Project Number: HM400098
UL Project Number: N/A
UL File Number: N/A
Sample Received Date: 2011-03-31
Sample Source: DC Canada
Catalog Number(s): 739P
Description: Twist on Wire Connectors without Oxide Inhibitor

Room Temp. (°C): 21.4
Room Humidity (%RH): 55
Test Date: 2011-06-02
Tested By (Print): Mike Henry/ Zach Winters
Witness/Approval:

Standard - NMX-J-548-ANCE-2004 • C22.2 NO. 188-04 • UL 486C (September 7, 2004)

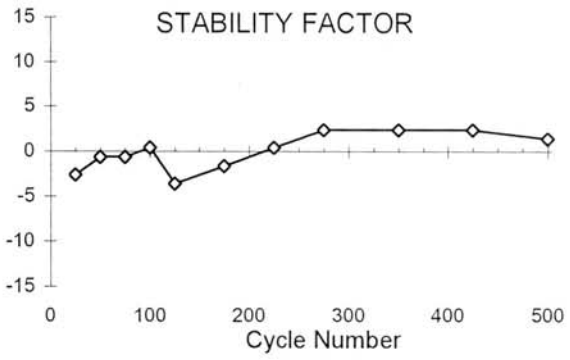
CURRENT CYCLING (CLAUSE 7.2 - September 7, 2004)

Procedure: The speciman sets per Clause 8.2 shall complete 500 cycles of equal current-on and current-off operations for the time and current specified in Table 6. Upon completion of the current-cycling test no connector shall exceed 125°C temperature rise and the stablity factor shall not exceed ±10.

Main Wire Size/Type: #10 Sol CCA, THHN or THWN, 90 deg C, 600V
Tap Wire Size/Type: #10 Sol CCA, THHN or THWN, 90 deg C, 600V
Strip Length (in.): 11/16"
Installation Tool: N/A
Die: N/A
Torque (in-lbf): 5
Number of Crimps: N/A
Cycling-Current (A): 60

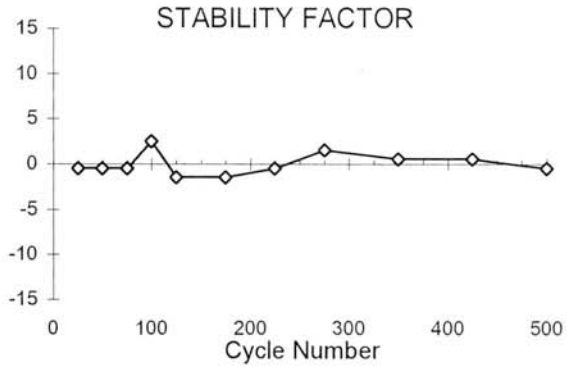
SAMPLE 15

Cycle Number	Actual (°C)	Control (°C)	Ambient (°C)	Heat Rise (°C)	Dev	"S" Factor
25	124	98	22	102	26	-2.6
50	125	97	22	103	28	-0.6
75	125	97	23	102	28	-0.6
100	122	93	23	99	29	0.4
125	121	96	23	98	25	-3.6
175	123	96	24	99	27	-1.6
225	126	97	24	102	29	0.4
275	125	94	24	101	31	2.4
350	127	96	24	103	31	2.4
425	128	97	24	104	31	2.4
500	130	100	24	106	30	1.4



SAMPLE 16

Cycle Number	Actual (°C)	Control (°C)	Ambient (°C)	Heat Rise (°C)	Dev	"S" Factor
25	116	98	22	94	18	-0.5
50	115	97	22	93	18	-0.5
75	115	97	23	92	18	-0.5
100	114	93	23	91	21	2.5
125	113	96	23	90	17	-1.5
175	113	96	24	89	17	-1.5
225	115	97	24	91	18	-0.5
275	114	94	24	90	20	1.5
350	115	96	24	91	19	0.5
425	116	97	24	92	19	0.5
500	118	100	24	94	18	-0.5



Notes:

Equip. (TFE #)	37	1356	1355	1061	519	1439	3314	1656	443		

T&B Project Number: HM400098
UL Project Number: N/A
UL File Number: N/A
Sample Received Date: 2011-03-31
Sample Source: DC Canada
Catalog Number(s): 65P
Description: Twist on Wire Connectors with Oxide Inhibitor

Room Temp. (°C): 21.4
Room Humidity (%RH): 55
Test Date: 2011-06-02
Tested By (Print): Mike Henry/ Zach Winters
Witness/Approval:

Standard - NMX-J-548-ANCE-2004 • C22.2 NO. 188-04 • UL 486C (September 7, 2004)

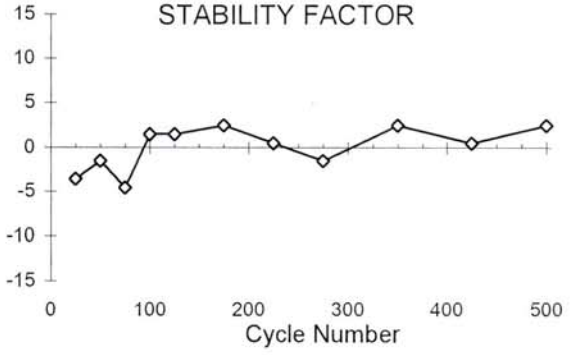
CURRENT CYCLING (CLAUSE 7.2 - September 7, 2004)

Procedure: The speciman sets per Clause 8.2 shall complete 500 cycles of equal current-on and current-off operations for the time and current specified in Table 6. Upon completion of the current-cycling test no connector shall exceed 125°C temperature rise and the stablity factor shall not exceed ±10.

Main Wire Size/Type: #10 Sol CCA, THHN or THWN, 90 deg C, 600V
Tap Wire Size/Type: #10 Sol CCA, THHN or THWN, 90 deg C, 600V
Strip Length (in.): 1/2"
Installation Tool: N/A
Die: N/A
Torque (in-lbf): 5
Number of Crimps: N/A
Cycling-Current (A): 60

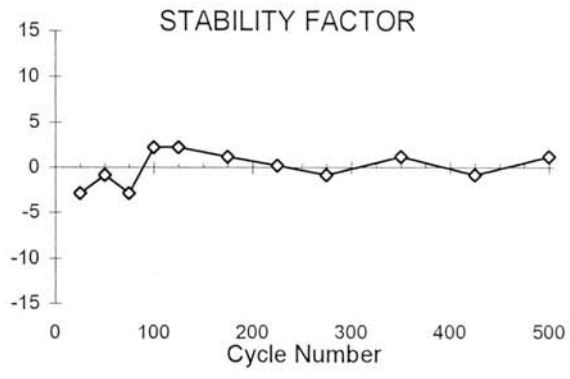
SAMPLE 29

Cycle Number	Actual (°C)	Control (°C)	Ambient (°C)	Heat Rise (°C)	Dev	"S" Factor
25	103	98	22	81	5	-3.5
50	104	97	22	82	7	-1.5
75	101	97	23	78	4	-4.5
100	103	93	23	80	10	1.5
125	106	96	23	83	10	1.5
175	107	96	24	83	11	2.5
225	106	97	24	82	9	0.5
275	101	94	24	77	7	-1.5
350	107	96	24	83	11	2.5
425	106	97	24	82	9	0.5
500	111	100	24	87	11	2.5



SAMPLE 30

Cycle Number	Actual (°C)	Control (°C)	Ambient (°C)	Heat Rise (°C)	Dev	"S" Factor
25	109	98	22	87	11	-2.8
50	110	97	22	88	13	-0.8
75	108	97	23	85	11	-2.8
100	109	93	23	86	16	2.2
125	112	96	23	89	16	2.2
175	111	96	24	87	15	1.2
225	111	97	24	87	14	0.2
275	107	94	24	83	13	-0.8
350	111	96	24	87	15	1.2
425	110	97	24	86	13	-0.8
500	115	100	24	91	15	1.2



Notes:

Equip. (TFE #)	37	1356	1355	1061	519	1439	3314	1656	443		

T&B Project Number: HM400098
UL Project Number: N/A
UL File Number: N/A
Sample Received Date: 2011-03-31
Sample Source: DC Canada
Catalog Number(s): 65P
Description: Twist on Wire Connectors with Oxide Inhibitor

Room Temp. (°C): 21.4
Room Humidity (%RH): 55
Test Date: 2011-06-02
Tested By (Print): Mike Henry/ Zach Winters
Witness/Approval:

Standard - NMX-J-548-ANCE-2004 • C22.2 NO. 188-04 • UL 486C (September 7, 2004)

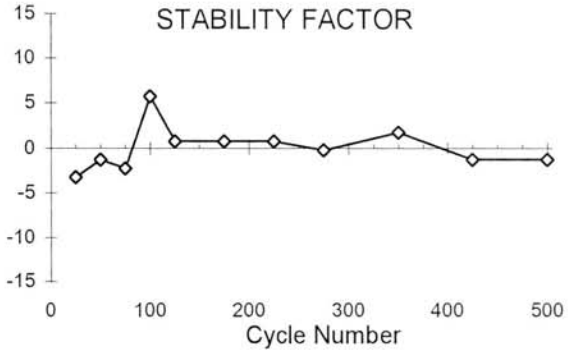
CURRENT CYCLING (CLAUSE 7.2 - September 7, 2004)

Procedure: The speciman sets per Clause 8.2 shall complete 500 cycles of equal current-on and current-off operations for the time and current specified in Table 6. Upon completion of the current-cycling test no connector shall exceed 125°C temperature rise and the stablity factor shall not exceed ±10.

Main Wire Size/Type: #10 Sol CCA, THHN or THWN, 90 deg C, 600V
Tap Wire Size/Type: #10 Sol CCA, THHN or THWN, 90 deg C, 600V
Strip Length (in.): 1/2"
Installation Tool: N/A
Die: N/A
Torque (in-lbf): 5
Number of Crimps: N/A
Cycling-Current (A): 60

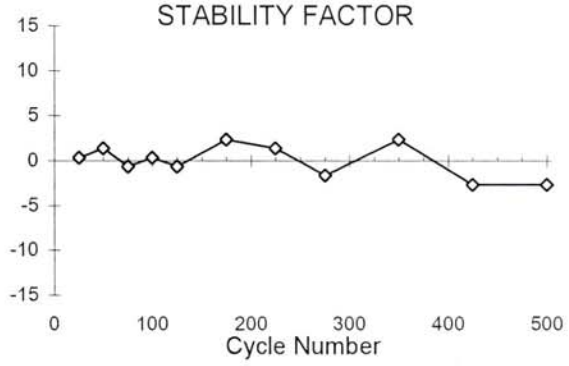
SAMPLE 31

Cycle Number	Actual (°C)	Control (°C)	Ambient (°C)	Heat Rise (°C)	Dev	"S" Factor
25	102	98	22	80	4	-3.3
50	103	97	22	81	6	-1.3
75	102	97	23	79	5	-2.3
100	106	93	23	83	13	5.7
125	104	96	23	81	8	0.7
175	104	96	24	80	8	0.7
225	105	97	24	81	8	0.7
275	101	94	24	77	7	-0.3
350	105	96	24	81	9	1.7
425	103	97	24	79	6	-1.3
500	106	100	24	82	6	-1.3



SAMPLE 32

Cycle Number	Actual (°C)	Control (°C)	Ambient (°C)	Heat Rise (°C)	Dev	"S" Factor
25	102	98	22	80	4	0.4
50	102	97	22	80	5	1.4
75	100	97	23	77	3	-0.6
100	97	93	23	74	4	0.4
125	99	96	23	76	3	-0.6
175	102	96	24	78	6	2.4
225	102	97	24	78	5	1.4
275	96	94	24	72	2	-1.6
350	102	96	24	78	6	2.4
425	98	97	24	74	1	-2.6
500	101	100	24	77	1	-2.6



Notes:

Equip. (TFE #)	37	1356	1355	1061	519	1439	3314	1656	443		

T&B Project Number: HM400098
UL Project Number: N/A
UL File Number: N/A
Sample Received Date: 2011-03-31
Sample Source: DC Canada
Catalog Number(s): 739P
Description: Twist on Wire Connectors without Oxide Inhibitor

Room Temp. (°C): 21.4
Room Humidity (%RH): 55
Test Date: 2011-06-02
Tested By (Print): Mike Henry/ Zach Winters
Witness/Approval:

Standard - NMX-J-548-ANCE-2004 • C22.2 NO. 188-04 • UL 486C (September 7, 2004)

STATIC-HEATING SEQUENCE (CLAUSE 7.3 - September 7, 2004)

Secureness • Static-Heat Rise • Pullout

Procedure:

The connectors were assembled to **aluminum** conductor and subjected to the static heating sequence of tests under the conditions outlined.

Main Wire Size/Type: #12 Sol Cu, THHN or THWN, 90 deg C, 600V
Tap Wire Size/Type: #12 Sol CCA, THHN or THWN, 90 deg C, 600V
Strip Length (in.): 11/16"
Installation Tool: N/A
Die: N/A
Torque (in-lbf): 3.5
Number of Crimps: N/A
Static Heat Current (A): 30
Required Pull (lbf): 35

Bushing Diameter (in.): 3/8
Secureness Height (in.): 11
Secureness Weight (lbf): 1.5
Secureness Duration (min): 30
Temperature Rise Limit (°C): 50
Duration of Pull (min): 1

Sample Number			1	2	3	4
*Initial Static Heating	Connector Temp. Readings Taken > 10 min. apart (°C)	1	57	51	56	60
		2	57	52	55	60
		3	57	52	55	60
	Ambient Temp. (°C)		20			
	Heat Rise (°C)		37	32	36	40
	Met S.H. Rqmt? (Yes/No)		Yes	Yes	Yes	Yes
Met Secureness Rqmt. (Yes/No)			Yes	Yes	Yes	Yes
*Repeat Static Heating	Connector Temp. Readings Taken > 10 min. apart (°C)	1	49	52	41	53
		2	51	53	41	53
		3	51	54	41	53
	Ambient Temp. (°C)		20			
	Heat Rise (°C)		31	34	21	33
	Met S.H. Rqmt? (Yes/No)		Yes	Yes	Yes	Yes
Met Pullout Rqmt. (Yes/No)			Yes	Yes	Yes	Yes
Ultimate Pullout (lbf) -*Internal Use* -						

*Additional temperature readings, if applicable, will be listed in the notes.

Notes:

Equip. (TFE #)	3204	2799	3242	1103	3222	2001	3110	1305	1233	218	1491
3031											

T&B Project Number: HM400098
UL Project Number: N/A
UL File Number: N/A
Sample Received Date: 2011-03-31
Sample Source: DC Canada
Catalog Number(s): 65P
Description: Twist on Wire Connectors with Oxide Inhibitor

Room Temp. (°C): 21.4
Room Humidity (%RH): 55
Test Date: 2011-06-02
Tested By (Print): Mike Henry/ Zach Winters
Witness/Approval:

Standard - NMX-J-548-ANCE-2004 • C22.2 NO. 188-04 • UL 486C (September 7, 2004)

STATIC-HEATING SEQUENCE (CLAUSE 7.3 - September 7, 2004)

Secureness • Static-Heat Rise • Pullout

Procedure:
The connectors were assembled to **aluminum** conductor and subjected to the static heating sequence of tests under the conditions outlined.

Main Wire Size/Type: #12 Sol Cu, THHN or THWN, 90 deg C, 600V
Tap Wire Size/Type: #12 Sol CCA, THHN or THWN, 90 deg C, 600V
Strip Length (in.): 1/2"
Installation Tool: N/A
Die: N/A
Torque (in-lbf): 3.5
Number of Crimps: N/A
Static Heat Current (A): 35
Required Pull (lbf): 30

Bushing Diameter (in.): 3/8
Secureness Height (in.): 11
Secureness Weight (lbf): 1.5
Secureness Duration (min): 30
Temperature Rise Limit (°C): 50
Duration of Pull (min): 1

Sample Number			17	18	19	20
*Initial Static Heating	Connector Temp. Readings Taken > 10 min. apart (°C)	1	51	49	49	47
		2	51	49	49	48
		3	51	49	50	49
	Ambient Temp. (°C)		23			
	Heat Rise (°C)		28	26	27	26
	Met S.H. Rqmt? (Yes/No)		Yes	Yes	Yes	Yes
Met Secureness Rqmt. (Yes/No)			Yes	Yes	Yes	Yes
*Repeat Static Heating	Connector Temp. Readings Taken > 10 min. apart (°C)	1	49	48	46	48
		2	49	49	46	49
		3	50	49	46	49
	Ambient Temp. (°C)		21			
	Heat Rise (°C)		29	28	25	28
	Met S.H. Rqmt? (Yes/No)		Yes	Yes	Yes	Yes
Met Pullout Rqmt. (Yes/No)			Yes	Yes	Yes	Yes
Ultimate Pullout (lbf) -*Internal Use* -						

*Additional temperature readings, if applicable, will be listed in the notes.

Notes:

Equip. (TFE #)	3204	2799	3242	1103	3222	2001	3110	1305	1233	218	1491
3031											

T&B Project Number: HM400098
UL Project Number: N/A
UL File Number: N/A
Sample Received Date: 2011-03-31
Sample Source: DC Canada
Catalog Number(s): 739P
Description: Twist on Wire Connectors without Oxide Inhibitor

Room Temp. (°C): 21.4
Room Humidity (%RH): 55
Test Date: 2011-06-02
Tested By (Print): Mike Henry/ Zach Winters
Witness/Approval:

Standard - NMX-J-548-ANCE-2004 • C22.2 NO. 188-04 • UL 486C (September 7, 2004)

STATIC-HEATING SEQUENCE (CLAUSE 7.3 - September 7, 2004)

Secureness • Static-Heat Rise • Pullout

Procedure:
The connectors were assembled to **aluminum** conductor and subjected to the static heating sequence of tests under the conditions outlined.

Main Wire Size/Type: #10 Sol CCA, THHN or THWN, 90 deg C, 600V
Tap Wire Size/Type: #10 Sol CCA, THHN or THWN, 90 deg C, 600V
Strip Length (in.): 11/16"
Installation Tool: N/A
Die: N/A
Torque (in-lbf): 5
Number of Crimps: N/A
Static Heat Current (A): 40
Required Pull (lbf): 40

Bushing Diameter (in.): 3/8
Secureness Height (in.): 11
Secureness Weight (lbf): 1.5
Secureness Duration (min): 30
Temperature Rise Limit (°C): 50
Duration of Pull (min): 1

Sample Number			5	6	7	8
*Initial Static Heating	Connector Temp. Readings Taken > 10 min. apart (°C)	1	54	55	57	50
		2	54	56	58	50
		3	54	56	58	50
	Ambient Temp. (°C)		19			
	Heat Rise (°C)		35	37	39	31
	Met S.H. Rqmt? (Yes/No)		Yes	Yes	Yes	Yes
Met Secureness Rqmt. (Yes/No)			Yes	Yes	Yes	Yes
*Repeat Static Heating	Connector Temp. Readings Taken > 10 min. apart (°C)	1	53	52	53	41
		2	54	53	54	41
		3	54	53	54	43
	Ambient Temp. (°C)		19			
	Heat Rise (°C)		35	34	35	24
	Met S.H. Rqmt? (Yes/No)		Yes	Yes	Yes	Yes
Met Pullout Rqmt. (Yes/No)			Yes	Yes	Yes	Yes
Ultimate Pullout (lbf) -*Internal Use* -						

*Additional temperature readings, if applicable, will be listed in the notes.

Notes:

Equip. (TFE #)	3204	2799	3242	4	945	2001	3110	1305	1233	218	1491
3031											

T&B Project Number: HM400098
UL Project Number: N/A
UL File Number: N/A
Sample Received Date: 2011-03-31
Sample Source: DC Canada
Catalog Number(s): 65P
Description: Twist on Wire Connectors with Oxide Inhibitor

Room Temp. (°C): 21.4
Room Humidity (%RH): 55
Test Date: 2011-06-02
Tested By (Print): Mike Henry/ Zach Winters
Witness/Approval:

Standard - NMX-J-548-ANCE-2004 • C22.2 NO. 188-04 • UL 486C (September 7, 2004)

STATIC-HEATING SEQUENCE (CLAUSE 7.3 - September 7, 2004)

Secureness • Static-Heat Rise • Pullout

Procedure:

The connectors were assembled to **aluminum** conductor and subjected to the static heating sequence of tests under the conditions outlined.

Main Wire Size/Type: #10 Sol CCA, THHN or THWN, 90 deg C, 600V
Tap Wire Size/Type: #10 Sol CCA, THHN or THWN, 90 deg C, 600V
Strip Length (in.): 1/2"
Installation Tool: N/A
Die: N/A
Torque (in-lbf): 5
Number of Crimps: N/A
Static Heat Current (A): 40
Required Pull (lbf): 40

Bushing Diameter (in.): 3/8
Secureness Height (in.): 11
Secureness Weight (lbf): 1.5
Secureness Duration (min): 30
Temperature Rise Limit (°C): 50
Duration of Pull (min): 1

Sample Number			21	22	23	24
*Initial Static Heating	Connector Temp. Readings Taken > 10 min. apart (°C)	1	56	55	49	58
		2	56	57	49	59
		3	58	57	50	59
	Ambient Temp. (°C)		22			
	Heat Rise (°C)		36	35	28	37
	Met S.H. Rqmt? (Yes/No)		Yes	Yes	Yes	Yes
Met Secureness Rqmt. (Yes/No)			Yes	Yes	Yes	Yes
*Repeat Static Heating	Connector Temp. Readings Taken > 10 min. apart (°C)	1	54	60	58	59
		2	55	59	58	59
		3	54	59	57	59
	Ambient Temp. (°C)		23			
	Heat Rise (°C)		32	37	35	36
	Met S.H. Rqmt? (Yes/No)		Yes	Yes	Yes	Yes
Met Pullout Rqmt. (Yes/No)			Yes	Yes	Yes	Yes
Ultimate Pullout (lbf) -*Internal Use* -						

*Additional temperature readings, if applicable, will be listed in the notes.

Notes:

Equip. (TFE #)	3204	2799	3242	4	945	2001	3110	1305	1233	218	1491
3031											

THOMAS & BETTS - Southaven Laboratory Test Facitity Equipment List

Tested By: Mike Henry/Zach Winters
Date: 6/2/11

T&B PROJECT #: N/A

UL File #: N/A
UL Project #: N/A

TFE NUMBER	EQUIPMENT DESCRIPTION	MANUFACTURER	SERIAL NUMBER	ACCURACY	LAST CALIBRATION DATE	CALIBRATION CYCLE	RANGE
4	AMMETER (A.C.)	WESTON	181104	.75%	1/6/11	1 YEAR	0 - 10A
37	AMMETER (A.C.)	WESTON	181393	.75%	6/24/10	1 YEAR	0 - 5A
945	C.T. 50:5	SIMPSON		2%	2/1/11	3 YEARS	C.T. 50:5
2001	TEMPERATURE INDICATOR	DORIC	363617	SEE MANUAL	6/28/10	1 YEAR	-200*C to 933*C
2799	TORQUE DRIVER	TOHNICHI	03800E		1/7/11	1 YEAR	0.1 to 5 in lb
3204	HYGRO-THERMOMETER	MANNIX	N/A	C++or-0.5%,H==-5	11/25/09	1 YEAR	RH=10%to95%,T=-58Fto158F
3222	C.T. 50:5	SIMPSON	N/A	0	1/21/08	3 YEARS	C.T. 50:5
3242	CLAMP AMMETER	FLUKE	92858041	0	3/1/10	1 YEAR	See Notes
3110	WEIGHT (1.5 LB CYLINDER)	T&B	N/A	+ - 2%	4/25/08	5 YEARS	Marked exact
1305	SECURENESS MACHINE	T&B		SEE MANUAL	1/0/00	0	0
1233	TIMER (60 MINUTES, GRA-LAB UNIVERSAL)	DIMCO-GRAY CO.			8/19/10	1 YEAR	0-60 MIN X 1 SEC
218	TENSILE MACHINE	TINIUS OLSEN	120868	SEE MANUAL	5/11/10	1 YEAR	Push/Pull, load cell range
1491	SPEED INDICATOR	TINIUS OLSEN	133763	SEE MANUAL	5/11/10	1 YEAR	Digital Readout
3031	LOAD CELL (2,400 POUNDS)	TINIUS OLSEN	088221		5/11/10	1 YEAR	-2400 to 2400 lbf
3	AMMETER (A.C.)	WESTON	180165	.75%	5/3/10	1 YEAR	0 - 10A
37	AMMETER (A.C.)	WESTON	181393	.75%	6/24/10	1 YEAR	0 - 5A
1355	TIMER	TENOR		SEE MANUAL	1/0/00	0	0
1515	TIMER	TENOR		SEE MANUAL	1/0/00	0	0
3222	C.T. 50:5	SIMPSON	N/A	0	1/21/08	3 YEARS	C.T. 50:5
1356	TIMER	TENOR		SEE MANUAL	1/0/00	0	0

THOMAS & BETTS - Southaven Laboratory Test Facitity Equipment List

Tested By: T&B PROJECT #: UL File #:

Date: UL Project #:

TFE NUMBER	EQUIPMENT DESCRIPTION	MANUFACTURER	SERIAL NUMBER	ACCURACY	LAST CALIBRATION DATE	CALIBRATION CYCLE	RANGE
1061	HARNESS CYCLING CONTROL	C.N.I.		SEE MANUAL	1/0/00	0	0
519	TEMPERATURE INDICATOR	DORIC	55493	SEE MANUAL	6/28/10	1 YEAR	-328*F to 1712*F
1439	C.T. 100:5	SIMPSON		1%	11/11/09	3 YEARS	C.T. 100:5
1103	AMMETER (A.C.)	WESTON	26585	SEE MANUAL	6/24/10	1 YEAR	0-200 (multi-range)
1519	WELDER	TECHNILAB		SEE MANUAL	1/0/00	0	0
1656	TEMPERATURE INDICATOR	DORIC	339479	SEE MANUAL	1/31/11	1 YEAR	-200*C to 933*C
443	POWER SUPPLY (CONSTANT CURRENT)	C.N.I.		SEE MANUAL	1/0/00	0	0
441	POWER SUPPLY (CONSTANT CURRENT)	C.N.I.		SEE MANUAL	1/0/00	0	0
3314	HYGRO-THERMOMETER	TAYLOR	N/A	0	3/22/10	1 YEAR	RH= 10% to 95%, T= -50C to 70C

Public Input No. 1015-NFPA 70-2017 [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.

Exception: insulation shall not be required for equipment grounding conductors or grounded condctors where these conductors are permitted to be bare or uninsulated.

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

Statement of Problem and Substantiation for Public Input

There is simply no need to provide insulation on an equipment ground wire that could otherwise be installed bare. Quite often equipment ground wires are in fact installed as an insulated conductor by the installers choice, such as a green #12 THWN or a #2 Black that has been taped green at its end. When these conductors are spliced, it makes no sense to require insulation to be installed to cover the bare ends of the conductors simply because the installer chose to install an insulated conductor when he could have installed a bare conductor in he first place. This same logic can also be applied to the grounded conductor where it is permitted to be bare or uninsulated.

Submitter Information Verification

Submitter Full Name: Russ Leblanc
Organization: Leblanc Consulting Services
Street Address:
City:
State:
Zip:
Submittal Date: Sun Jun 11 10:31:05 EDT 2017

Public Input No. 3222-NFPA 70-2017 [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 and labeled for such use.

Additional Proposed Changes

File Name	Description	Approved
PC_976.pdf	70_PC976	✓

Statement of Problem and Substantiation for Public Input

NOTE: This Public Input appeared as “Reject but Hold” in Public Comment No. 976 of the (A2016) Second Draft Report for NFPA 70 and per the Regs. at 4.4.8.3.1.

Substantiation: CMP 1 within the committee statement stated "This section currently aligns with common labeling requirements in product safety standards," the product safety standards do not include requirements for certification (listing) labels. The statement also stated "Labeling of listed equipment is not possible in all cases or conditions such as if products are too small to be labeled or for some severe environmental conditions. Manufacturers require the flexibility afforded for listed products relative to when labels should be applied and when the information on the smallest package is sufficient, and practical." This statement seems to reinforce the need for an informational note to the definition of labeled as submitted under PI 1072.

UL recognizes the Correlating Committee created a global First Correlating Revision (FCR) which directed that in all locations where the term “and labeled” was added after “listed” during the First Revision Stage, the words “and labeled” after “listed” be deleted, returning to previous text. UL understands that the Correlating Committee appointed a task group to address several issues involving the use of the terms “listed” and “labeled,” most importantly, to clarify and establish a distinction between the terms “listed” and “labeled” which are often used interchangeably. UL supports the need for this task group. However, UL does not expect the work of this task group to affect the 2017 NEC regarding the issue of “listed and labeled.” As such, UL is submitting comments to request that the words “and labeled” be added in various locations throughout the Code for the reasons expressed in the public inputs UL submitted on this issue. UL believes that these revisions will address an ongoing problem that should not wait until the 2020 NEC for resolution.

Subsequent to the Public Input Code Panel Meetings, UL has discussed this issue with its Electrical Council whose membership includes many AHJs. The proposed revisions to the NEC received general support from the membership. This issue was also discussed at a NEMA – NRTLs Forum held on August 14, 2015 at NEMA Headquarters. UL reiterated its support for the proposed revisions. The NRTLs represented at the meeting voiced no objection to the proposals.

The rationale for the revision was simple, to provide information to the AHJ regarding the suitability of equipment they encounter. The mark on the product is the manufacturer’s attestation that the product is in compliance with the appropriate standard. NRTL’s conduct factory surveillance of products, surveillance is one method to validate the manufacturer’s attestation. Should a product be found not to be compliant the manufacturer has the option of removing the mark and shipping the product without the mark, or holding the shipment and bringing the product into compliance. In either case the “Listing” is not impacted, as the “listing” is created at the completion of the “original” certification of the product and indicates the authorization but not the mandate to label products. So the only true way an AHJ can determine whether the product he is seeing is compliant with the applicable standard is via a label on the product. Taking it one step further, listings change with time. It is quite possible that a “listing” has been withdrawn; however labeled product may still be available for sale. Should equipment that is labeled, but not listed, be deemed

acceptable? Based on the NEC definitions, it is possible to have a product that meets the Article 100 definition of listed but the testing organization made the manufacture remove the label for a non-compliance issue.

As for the concerns of products that are too small to be labeled, the definition of labeled is not limited to an actual label, it also includes symbols, or other identifying marks. The Safety Standards which define the listing requirements do not address labeling of products as defined by Article 100. As a general rule, NRTL's do not consider a product as being listed unless it is also labeled. The UL White Book states that "Only those products bearing the appropriate UL Mark and the company's name, trade name, trademark or other authorized identification should be considered as being covered by UL's Certification, Listing, Classification and Follow-Up Service. The UL Mark provides evidence of listing or labeling, which may be required by installation codes or standards." Again the requirements for the UL Mark are not a Safety Standard requirement, they are a UL requirement and the only way to show that a product is UL Certified (Listed); other NRTL's have similar requirements.

Submitter Information Verification

Submitter Full Name: CMP ON NEC-P01
Organization: Code-Making Panel 1
Street Address:
City:
State:
Zip:
Submittal Date: Mon Sep 04 13:05:17 EDT 2017

Public Comment No. 976-NFPA 70-2015 [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 and labeled for such use.

Additional Proposed Changes

File Name	Description	Approved
Essential_Guide_to_Product_Testing_and_Certification_NOV_2014.pdf	ETL Essential Guide to Product Testing & Certification 2014/2015 North American Edition. Please review document page numbers 5, 8 and 10 to see that ETL has requirements similar to UL, that products that do not bear their certification (listed) mark are not considered by ETL as being listed.	

Statement of Problem and Substantiation for Public Comment

CMP 1 within the committee statement stated "This section currently aligns with common labeling requirements in product safety standards," the product safety standards do not include requirements for certification (listing) labels. The statement also stated "Labeling of listed equipment is not possible in all cases or conditions such as if products are too small to be labeled or for some severe environmental conditions. Manufacturers require the flexibility afforded for listed products relative to when labels should be applied and when the information on the smallest package is sufficient, and practical." This statement seems to reinforce the need for an informational note to the definition of labeled as submitted under PI 1072.

UL recognizes the Correlating Committee created a global First Correlating Revision (FCR) which directed that in all locations where the term “and labeled” was added after “listed” during the First Revision Stage, the words “and labeled” after “listed” be deleted, returning to previous text. UL understands that the Correlating Committee appointed a task group to address several issues involving the use of the terms “listed” and “labeled,” most importantly, to clarify and establish a distinction between the terms “listed” and “labeled” which are often used interchangeably. UL supports the need for this task group. However, UL does not expect the work of this task group to affect the 2017 NEC regarding the issue of “listed and labeled.” As such, UL is submitting comments to request that the words “and labeled” be added in various locations throughout the Code for the reasons expressed in the public inputs UL submitted on this issue. UL believes that these revisions will address an ongoing problem that should not wait until the 2020 NEC for resolution.

Subsequent to the Public Input Code Panel Meetings, UL has discussed this issue with its Electrical Council whose membership includes many AHJs. The proposed revisions to the NEC received general support from the membership. This issue was also discussed at a NEMA – NRTLs Forum held on August 14, 2015 at NEMA Headquarters. UL reiterated its support for the proposed revisions. The NRTLs represented at the meeting voiced no objection to the proposals.

The rationale for the revision was simple, to provide information to the AHJ regarding the suitability of equipment they encounter. The mark on the product is the manufacturer’s attestation that the product is in compliance with the appropriate standard. NRTL’s conduct factory surveillance of products, surveillance is one method to validate the

manufacturer's attestation. Should a product be found not to be compliant the manufacturer has the option of removing the mark and shipping the product without the mark, or holding the shipment and bringing the product into compliance. In either case the "Listing" is not impacted, as the "listing" is created at the completion of the "original" certification of the product and indicates the authorization but not the mandate to label products. So the only true way an AHJ can determine whether the product he is seeing is compliant with the applicable standard is via a label on the product. Taking it one step further, listings change with time. It is quite possible that a "listing" has been withdrawn; however labeled product may still be available for sale. Should equipment that is labeled, but not listed, be deemed acceptable? Based on the NEC definitions, it is possible to have a product that meets the Article 100 definition of listed but the testing organization made the manufacture remove the label for a non-compliance issue.

As for the concerns of products that are too small to be labeled, the definition of labeled is not limited to an actual label, it also includes symbols, or other identifying marks. The Safety Standards which define the listing requirements do not address labeling of products as defined by Article 100. As a general rule, NRTL's do not consider a product as being listed unless it is also labeled. The UL White Book states that "Only those products bearing the appropriate UL Mark and the company's name, trade name, trademark or other authorized identification should be considered as being covered by UL's Certification, Listing, Classification and Follow-Up Service. The UL Mark provides evidence of listing or labeling, which may be required by installation codes or standards." Again the requirements for the UL Mark are not a Safety Standard requirement, they are a UL requirement and the only way to show that a product is UL Certified (Listed); other NRTL's have similar requirements.

Related Item

Public Input No. 1072-NFPA 70-2014 [Definition: Labeled.]

Public Input No. 1073-NFPA 70-2014 [Section No. 110.14(B)]

Submitter Information Verification

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Submittal Date: Tue Sep 22 17:36:12 EDT 2015

Committee Statement

Committee Action: Rejected but held

Resolution: The inconsistent actions on Public Inputs to globally change the term "listed or labeled" to "listed and labeled" resulted in multiple inconsistencies through the NEC and created conflicts with other Codes and Standards that use the term. CMP-1 understands that the NEC Correlating Committee took action to develop a first revision that restores the NEC rules using the term listed or labeled to how those rules appeared in the 2014 edition. CMP-1 also understands that the NEC Correlating Committee has formed a Task Group to globally review the use of the term "listed or labeled" throughout the NEC and determine a simplified solution that addresses the terms listed, labeled, and their associated informational notes. The Task Group is to address the concerns and input from multiple qualified electrical testing laboratories and work toward a simple solution that resides within Article 100 and perhaps Article 110. The work of that task group is just getting started and may include proposed revisions to these existing definitions and associated informational notes. CMP-1 recognizes it is premature to incorporate the proposed revisions and informational note at this time.

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Public Input No. 4078-NFPA 70-2017 [New Section after 110.14(C)(1)]

110.14 (C)(1)(c)

(c) Termination provisions of equipment for circuits rated over 1000 amperes and connected to engineered conductor systems, or marked for conductors larger than 1/0 AWG, shall be used only for one of the following:

(1) Conductors rated 75C (167F)

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

(3) Conductor sizing recommended or required by the equipment manufacturer's instructions based on engineering judgement or testing data such that the operating conditions of the equipment do not exceed the operating temperature of the equipment.

Statement of Problem and Substantiation for Public Input

Technical Justification:
1) The switchgear and distribution equipment between 100A and 1000A+ range has a great variety and there are a large variety of installation methods instructed to the installers on a project-to-project basis. This leads to a lot of sources of confusion and mis-application, as well as having installations where various connected equipment are not well-coordinated.
2) This differentiates the use of engineered systems from bulk-ordered materials. The goal is to allow engineered solutions without sacrificing safety.
3) The input submitter would like to encourage a robust discussion on best practices in connecting distribution equipment to engineered and bulk conductor systems, as well as a discussion on how specifically the best practices should be published as requirements.

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Submittal Date: Thu Sep 07 13:38:01 EDT 2017

Public Input No. 926-NFPA 70-2017 [New Section after 110.14(C)(1)]

Table 110.14(C)(1)

Table 110.14(C)(1) Maximum equipment termination current

Size AWG or kcmil	60°C (140°F)	75°C (167°F)	60°C (140°F)
	COPPER		ALUMINUM OR C
18	-	-	-
16	-	-	-
14	15 *	20	-
12	20 *	25	15 *
10	30 *	35	25 *
8	40 *	50	35 *
6	55 *	65	40 *
4	70 *	85	55 *
3	85 *	100	65 *
2	95 *	115	75 *
1	110 *	130	85 *
1/0		150 **	
2/0		175 **	
3/0		200 **	
4/0		230 **	
250		255 **	
300		285 **	
350		310 **	
400		335 **	
500		380 **	
600		420 **	
700		460 **	
750		475 **	
800		490 **	
900		520 **	
1000		545 **	
1250		590 **	
1500		625 **	
1750		650 **	
2000		665 **	

* Minimum ampacity when the temperature rating of the equipment termination is not known. Reference

110.14(C)(1)(a)

** Minimum ampacity when the temperature rating of the equipment termination is not known. Reference 110.14(C)(1)(b)

Statement of Problem and Substantiation for Public Input

This public input is the work of an Ampacity Task Group. The task group consisted of the following members: Thomas Domitrovich, Dave Mercier, Christine Porter, Derrick Atkins, and Christel Hunter.

Table 310.15(B)(16) has historically been used for two separate functions.

Table 310.15(B)(16) is used as the starting point for determining ampacity of a conductor when adjustments or correction factors are applied to address conditions of use which include ambient temperature and number of conductors in a raceway.

Table 310.15(B)(16) has also been used to identify the limitations placed on the conductor when terminating in equipment.

The intent of this PI is to separate these two functions.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 927-NFPA 70-2017 [Section No. 110.14(C)(1)]	New table for 110.14 addressing terminations

Submitter Information Verification

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Public Input No. 3418-NFPA 70-2017 [New Section after 110.14(D)]

TITLE OF NEW CONTENT

Type your content here ...Informational Note : See Informative Annex I Recommended Tightning Torque Tables from UL Standard 486A-B

Statement of Problem and Substantiation for Public Input

Directing the code user to this Informative Annex will assist them in implementing a proper torque for electrical connections found in the new requirement in 110.14(D) of the 2017 NEC. Absent the manufacturers installation instructions (MII) these values found in the UL Torque Tables will provide a recommended torque value for such connections. The NEC Style Manual provides guidance on the use and importance of Informational Note use.
3.1.3 Informational Notes. Informational notes contain explanatory information and shall be located directly after the rule they apply to. 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 Code, consideration should be given to rewriting the text of the code.

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Public Input No. 1820-NFPA 70-2017 [New Section after 110.16]

(C) Modifications. When modifications to the electrical installation occur that affect the available fault current at the service, the available fault current shall be verified or recalculated as necessary to ensure the service equipment ratings are sufficient for the available fault current at the line terminals of the equipment. When modifications occur that affect the clearing time for the service overcurrent protective device, the clearing time must be documented. The required field marking(s) in 110.16(B) shall be adjusted to reflect the new level of available fault current and/or clearing time.

Statement of Problem and Substantiation for Public Input

Provides notice that modifications to a service affecting fault current or clearing time must be documented to allow an accurate recalculation for arc flash values as well as a verification that fault current withstand capability is consistent with new values.

Submitter Information Verification

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Public Input No. 1487-NFPA 70-2017 [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~~ in accordance with 110.14(C)(1) or (2) as applicable .

Statement of Problem and Substantiation for Public Input

Delete text related to conductor ampacity, this is covered in 310.15(B), and only adds confusion by having it here.

Submitter Information Verification

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Submittal Date: Tue Aug 01 10:15:23 EDT 2017

Public Input No. 1488-NFPA 70-2017 [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 310.15(B)(16) as appropriately modified by 310.15(B)(7).

(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 , in accordance with Table 310.15(B)(16), 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 , in accordance with Table 3 10 . 15(B)(16).

(f) 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:

(7) Conductors rated 75°C (167°F)

(8) Conductors with higher temperature ratings, provided the ampacity of such conductors does not exceed the 75°C (167°F) ampacity

~~of~~

(1) , in accordance with Table 310.15(B)(16), of the conductor size used, or up to their ampacity if the equipment is listed and identified for use with such conductors

Statement of Problem and Substantiation for Public Input

Add text ", in accordance with Table 310.15(B)(16)," at three locations for clarity.

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Public Input No. 927-NFPA 70-2017 [Section No. 110.14(C)(1)]

(1) Equipment Provisions.

The determination of termination provisions of equipment shall be based on Table 110.14(C)(1) as determined by 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 310.15(B)(16) as appropriately modified by 310.15(B)(7) .

(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.

(f) 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:

(7) Conductors rated 75°C (167°F)

(8) 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

Statement of Problem and Substantiation for Public Input

This public input is the work of an Ampacity Task Group. The task group consisted of the following members: Thomas Domitrovich, Dave Mercier, Christine Porter, Derrick Atkins, and Christel Hunter.

Table 310.15(B)(16) has historically been used for two separate functions.

Table 310.15(B)(16) is used as the starting point for determining ampacity of a conductor when adjustments or correction factors are applied to address conditions of use which include ambient temperature and number of conductors in a raceway.

Table 310.15(B)(16) has also been used to identify the limitations placed on the conductor when terminating in equipment.

This PI is a companion PI 926 which introduced a new Table 110.14(C)(1). The intent is to separate these two above identified functions.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 926-NFPA 70-2017 [New Section after 110.14(C)(1)]	references new table.

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Copyright Assignment

Public Input No. 3898-NFPA 70-2017 [New Section after 110.21(B)]

(C) Marking for Separately Derived Systems

Marking shall be provided by the manufacturer to indicate whether or not the grounded conductor of separately derived system equipment is bonded to its frame. Where the bonding is modified in the field, additional marking shall be required to indicate whether the grounded conductor is bonded to the frame.

Statement of Problem and Substantiation for Public Input

NEC 445.11 requires factory marking of generators to indicate whether or not the generator grounded (neutral) conductor is bonded to its frame. Additional power supply products exist that can be operated as separately derived systems or not. Identification of a bonded grounded (neutral) condition exist for those energy sources also, but the only current marking requirement is in Article 445. Some power supplies do not have a Chapter 4 Article where this requirement could be located. Additionally, locating the requirement in Article 110 could reduce the correlation issues from product to product as new articles are created. Examples of other equipment include: UPS, transformers, PV Systems (small and large), fuel cells, wind systems, etc.

Submitter Information Verification

Submitter Full Name: Donald Cook
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Submittal Date: Thu Sep 07 08:31:12 EDT 2017

Public Input No. 1613-NFPA 70-2017 [Section No. 110.14(D)]

(D) ~~Installation~~ Tightening Torque .

Where a tightening torque is indicated as a numeric value on equipment or in installation instructions provided by the manufacturer, a calibrated torque tool shall be used to achieve the indicated torque value, unless the equipment manufacturer has provided installation instructions for an alternative method of achieving the required torque.

Informational Note: Additional information for torqueing threaded connections and terminations can be found in Section 8.11 of NFPA 70B-2016, Recommended Practice for Electrical Equipment Maintenance.

Statement of Problem and Substantiation for Public Input

New informational note will help the Code user better understand what is required for both new and existing installations as it relates to proper terminations to ensure a safe installation. Important considerations include:
8.11.1 Initial Installation.
8.11.2 Methods for Verifying Proper Tightness After Initial Installation.
8.11.3 Checking Tightness Where There Are No Signs of Degradation.
8.11.4 Checking Tightness When There Are Signs of Degradation.

Submitter Information Verification

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Submittal Date: Wed Aug 02 11:36:26 EDT 2017

Public Input No. 1619-NFPA 70-2017 [Section No. 110.14(D)]

(D) Installation.

~~Option 1:~~

~~(D) Installation.~~ ~~Where a~~

~~tightening torque is~~

~~T~~ ~~ightening torque~~ ~~values for terminal connections shall be as~~ ~~indicated as a numeric value on equipment or in installation instructions provided by the manufacturer, a calibrated torque tool shall be used to achieve the indicated torque value, unless the equipment manufacturer has provided installation instructions for an alternative method of achieving the required torque.~~

Option 2:

(D) Installation. ~~Where a~~ T ightening torque values for terminal connections shall be as indicated as a numeric value on equipment or in installation instructions provided by the manufacturer, a ~~calibrated~~ torque tool shall be used to achieve the indicated torque value, unless the equipment manufacturer has provided installation instructions for an alternative method of achieving the required torque.

Substantiation: This new section introduced in the 2017 NEC has created undue confusion for installers and the authority having jurisdictions. Prescribing the specific characteristics and features of tools is beyond the NEC scope. Use of a calibrated tool to achieve required torque values is already inherent to and implied by the rule as revised, and is more consistent with how this practice was managed using only 110.3(B) in the previously editions of the NEC. Other tools required for electrical installations covered by the NEC rules also require calibration, yet the there is no mention of it in the Code. It is just implied that the appropriate tool must be used for the installation to perform as intended.

Statement of Problem and Substantiation for Public Input

This new section introduced in the 2017 NEC has created undue confusion for installers and the authority having jurisdictions. Prescribing the specific characteristics and features of tools is beyond the NEC scope. Use of a calibrated tool to achieve required torque values is already inherent to and implied by the rule as revised, and is more consistent with how this practice was managed using only 110.3(B) in the previously editions of the NEC. Other tools required for electrical installations covered by the NEC rules also require calibration, yet the there is no mention of it in the Code. It is just implied that the appropriate tool must be used for the installation to perform as intended.

Submitter Information Verification

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Public Input No. 1926-NFPA 70-2017 [Section No. 110.14(D)]

(D) Installation.

Where a tightening torque is indicated as a numeric value on equipment or in installation instructions provided by the manufacturer, a ~~calibrated~~ torque tool capable of calibration shall be used to achieve the indicated torque value, unless the equipment manufacturer has provided installation instructions for an alternative method of achieving the required torque.

Statement of Problem and Substantiation for Public Input

When this requirement was introduced into the 2017 NEC, was there anything new about torqueing requirements? NO. This section
was an attempt to simply state that the torqueing needed to be achieved with a tool designed for that purpose (not the installer's right
arm). The main purpose of this requirement has been manipulated by putting more emphasis on the tool itself rather than achieving
the recommended torque value. The emphasis has been placed on keeping the torque tool "calibrated" more than the unquestioned
need for maintaining torque values on the conductor/termination itself.

Submitter Information Verification

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Submittal Date: Tue Aug 08 15:27:54 EDT 2017

Public Input No. 2645-NFPA 70-2017 [Section No. 110.14(D)]

(D) Installation.

Where a tightening torque is indicated as a numeric value on equipment or in installation instructions provided by the manufacturer, a calibrated torque tool shall be used to achieve the indicated torque value, unless the equipment manufacturer has provided installation instructions for an alternative method of achieving the required torque. Alternate methods of achieving torque shall be permitted when the method has a visual indicator that the proper torque has been applied.

Statement of Problem and Substantiation for Public Input

Allowing alternate methods to achieve a torque value should leave a visual indication that the appropriate design torque has been reached. For example, a shear bolt or other breakaway style device might have a different shape or color that indicates the shear portion has been detached and that the connection was properly tightened.

Submitter Information Verification

Submitter Full Name: Christel Hunter
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Submittal Date: Wed Aug 23 12:18:12 EDT 2017

Public Input No. 3135-NFPA 70-2017 [Section No. 110.14(D)]

~~**(D)** Installation.~~

~~Where a tightening torque is indicated as a numeric value on equipment or in installation instructions provided by the manufacturer, a calibrated torque tool shall be used to achieve the indicated torque value, unless the equipment manufacturer has provided installation instructions for an alternative method of achieving the required torque.~~

Statement of Problem and Substantiation for Public Input

The requirements for tightening torque are contained in the installation instructions and product listings which are already incorporated in the Code. Provisions such as demonstrating the torque value and proving that tools are properly calibrated are difficult if not impossible to enforce consistently. This section should be deleted in its entirety because it does not add clarity to the previously existing technical requirements and adds unclear enforcement challenges for inspectors and installers.

Submitter Information Verification

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Submittal Date: Fri Sep 01 13:36:10 EDT 2017

Public Input No. 3988-NFPA 70-2017 [Section No. 110.14(D)]

(D) Installation.

Where a tightening torque is indicated as a numeric value on equipment or in installation instructions provided by the manufacturer, a calibrated torque tool shall be used to achieve the indicated torque value, unless the equipment manufacturer has provided installation instructions for an alternative method of achieving the required torque.

Informational Note: The equipment manufacturer may be contacted if numeric torque values on the equipment or its accompanying instructions are not unavailable or are missing.

Statement of Problem and Substantiation for Public Input

Since the addition of this new requirement in the 2017 code requiring the use of torque wrenches there has been a great deal of focus on torque values in the field and there have been many inquiries regarding proper torque values when instructions are missing. There are many different types of terminations today requiring specific torque values. It is important for safe installation that installers follow manufactures specified torque values and not guess or use some default value.
Most manufacturers can readily provide this information either through their customer service or directly on the web.

Submitter Information Verification

Submitter Full Name: David Lutz
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Submittal Date: Thu Sep 07 11:40:10 EDT 2017

Public Input No. 4083-NFPA 70-2017 [Section No. 110.14(D)]

(D) Installation.

Where a tightening torque is indicated as a numeric value on equipment or in installation instructions provided by the manufacturer, a calibrated torque tool shall be used to achieve the indicated torque value, unless the equipment manufacturer has provided installation instructions for an alternative method of achieving the required torque.

Informational Note: The equipment manufacturer should be contacted if numeric torque values are not on the equipment nor noted within the accompanying installation instructions, or if the installation instructions are not available or are missing.

Statement of Problem and Substantiation for Public Input

Since the addition of this new requirement in the 2017 NEC requiring the use of torque wrenches, there has been a great deal of focus on torque values in the field; as such, there have been many inquiries regarding proper torque values when instructions are missing. There are many different types of terminations today requiring specific torque values. It is important for safe installation that installers follow manufacturers' specified torque values, and that they not simply guess or use some default value out of expediency.

Most manufacturers can readily provide this information either through their customer service or directly on the Web.

Submitter Information Verification

Submitter Full Name: Stephen Rood
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Submittal Date: Thu Sep 07 13:45:32 EDT 2017

Public Input No. 522-NFPA 70-2017 [Section No. 110.14(D)]

(D) Installation.

~~Where a tightening torque is~~ Tightening torque for terminal connections shall be as indicated as a numeric value on equipment or in installation instructions provided by the manufacturer, ~~a calibrated torque tool shall be used to achieve the indicated torque value,~~ unless the equipment manufacturer has provided installation instructions for an alternative method of achieving the required torque.

Statement of Problem and Substantiation for Public Input

This new section introduced in the 2017 NEC has created undue confusion for installers and the authority having jurisdictions. Prescribing the specific characteristics and features of tools is beyond the NEC scope. Use of a calibrated tool to achieve required torque values is already inherent to and implied by the rule as revised, and is more consistent with how this practice was managed using only 110.3(B) in the previously editions of the NEC.

Submitter Information Verification

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Submittal Date: Thu Apr 13 14:03:51 EDT 2017

Public Input No. 3559-NFPA 70-2017 [Section No. 110.16]

110.16 Arc-Flash Hazard Warning.

(A) General.

Electrical equipment, such as switchboards, switchgear, panelboards, industrial control panels, meter socket enclosures, and motor control centers, that is in other than dwelling units, and is likely to require examination, adjustment, servicing, or maintenance while energized, shall be field or factory marked to warn qualified persons of potential electric arc flash hazards. The marking shall meet the requirements in 110.21(B) and shall be located so as to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.

(B) Service Equipment.

In other than dwelling units, in addition to the requirements in (A), a permanent label shall be field or factory applied to service equipment 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 is applied in accordance with acceptable industry practice.

Informational Note No. 1: *NFPA 70E*-~~2015~~ 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. 2: ANSI Z535.4-2011, *Product Safety Signs and Labels*, provides guidelines for the design of safety signs and labels for application to products.

Informational Note No. 3: Acceptable industry practices for equipment labeling are described in *NFPA 70E*- ~~2015~~ 2018, *Standard for Electrical Safety in the Workplace*. 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 Input

Update the Code NFPA 70 to include the soon to be latest NFPA 70E, 2018 Edition.

Submitter Information Verification

Submitter Full Name: Michael Weitzel
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Submittal Date: Wed Sep 06 13:40:25 EDT 2017

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Public Input No. 4230-NFPA 70-2017 [Section No. 110.16]

110.16 Arc-Flash Hazard Warning.

(A) General.

Electrical equipment, such as switchboards, switchgear, panelboards, industrial control panels, meter socket enclosures, and motor control centers, that is in other than dwelling units, and is likely to require examination, adjustment, servicing, or maintenance while energized, shall be field ~~or factory~~ marked to warn qualified persons of potential electric arc flash hazards. The marking shall meet the requirements in 110.21(B) and shall be located so as to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.

(B) Service Equipment.

In other than dwelling units, in addition to the requirements in (A), a permanent label shall be ~~field or factory~~ field applied to service equipment 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 is applied in accordance with acceptable industry practice.

Informational Note No. 1: *NFPA 70E*-2015, *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. 2: ANSI Z535.4-2011, *Product Safety Signs and Labels*, provides guidelines for the design of safety signs and labels for application to products.

Informational Note No. 3: Acceptable industry practices for equipment labeling are described in *NFPA 70E*-2015 *Standard for Electrical Safety in the Workplace*. 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.

Informational Note No. 4: Manufacturers can supply properly designed labels to be installed as directed by the engineer in the field to document the information required in (B).

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Statement of Problem and Substantiation for Public Input

The existing language to have the label applied at the factory has caused some confusion to those authorized to install or inspect this equipment. The information listed in (B) is the responsibility of the engineer authorized to design the electrical system and document the required information.

Submitter Information Verification

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Public Input No. 1490-NFPA 70-2017 [Section No. 110.16(A)]

(A) General.

Electrical equipment, such as disconnects, switchboards, switchgear, panelboards, industrial control panels, meter socket enclosures, and motor control centers, that is in other than dwelling units, and is likely to require examination, adjustment, servicing, or maintenance while energized, shall be field or factory marked to warn qualified persons of potential electric arc flash hazards. The marking shall meet the requirements in 110.21(B) and shall be located so as to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.

Statement of Problem and Substantiation for Public Input

The addition of 'disconnects' is very important, because the way it's written, a 1000A disconnect does not require an arc flash label, but the 200A meter enclosures do...

Submitter Information Verification

Submitter Full Name: Mike Holt
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Submittal Date: Tue Aug 01 10:39:04 EDT 2017

Public Input No. 3574-NFPA 70-2017 [Section No. 110.16(A)]

(A) General.

Electrical equipment, such as switchboards, switchgear, panelboards, industrial control panels, meter socket enclosures, ~~and~~ cutout boxes rated at 100 amperes or higher, and motor control centers, ~~that is~~ that are located in other than dwelling units, ~~and is~~ and are likely to require examination, adjustment, servicing, or maintenance while energized, shall be field or factory marked to warn qualified persons of potential electric arc flash hazards. The marking shall meet the requirements in 110.21(B) and shall be located so as to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.

Statement of Problem and Substantiation for Public Input

A fused cutout box type disconnect switch or circuit breaker enclosure with a rating of 100 amperes or more, especially when operating at 480-volts or more, presents a significant arc-flash incident energy hazard to qualified workers.
The Code should remove the ambiguity and make it clear that these installations do present an arc-flash hazard to workers.
Consider the videos provided by Westex and other manufacturers of PPE work wear clothing.
In these video presentations, Arc Flash events are shown via an 'arc-in-a-box' at 100 amperes, on a 480-volt 3 phase bolted fault.
And, the higher the amperage, particularly at 480-volts, the greater the hazard to electrical workers.
Consider an 800-ampere switch that is not a service disconnect, and therefore does not require GFPE, because the 1,000 ampere threshold has not been reached for overcurrent device rating. Yet, there is no clear requirement for an Arc Flash Hazard Warning Label.
Many manufacturers are already providing a decal on their enclosure for this purpose.

Submitter Information Verification

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Public Input No. 3756-NFPA 70-2017 [Section No. 110.16(B)]

(B) Service Equipment.

In other than dwelling units, in addition to the requirements in (A), a permanent label shall be field or factory applied to service equipment 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

(5) The following warning or equivalent:

Warning - The clearing time provided affords no protection from faults on the line side of the protective element or from faults that propagate from the load side to the line side of the protective element.

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: *NFPA 70E*-2015, *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. 2: ANSI Z535.4-2011, *Product Safety Signs and Labels*, provides guidelines for the design of safety signs and labels for application to products.

Informational Note No. 3: Acceptable industry practices for equipment labeling are described in *NFPA 70E*-2015 *Standard for Electrical Safety in the Workplace*. 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.

Informational Note No. 4: The clearing time serves only to limit damage for arcing events on the load side of the protective element. Arcing faults within the same enclosure as the protective element may occur on the line side or propagate to the line side removing any benefit provided by the protective element clearing time. Barriers within an enclosure installed to segregate the line side from the load side provide a reduced exposure to electric shock and should not be considered to provide arc flash protection unless internal arcing fault testing has been performed to demonstrate such protection.

Statement of Problem and Substantiation for Public Input

The available fault current and clearing time marking required by this section are initial steps to determine the arc flash hazard downstream of the service equipment. Unless the equipment has been evaluated for internal arcing faults, an arcing fault within the service equipment enclosure can propagate to the line side of the protective element and remove any benefit from the protective element clearing time. Clarifying the marking is necessary to ensure maintenance and service personnel determine the arc flash hazard without benefit of the clearing time when working in the service equipment. The marking text being proposed is based on current code language from section 230.95 Informational Note No. 1.

Submitter Information Verification

Submitter Full Name: Chad Kennedy
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Public Input No. 4068-NFPA 70-2017 [Section No. 110.16(B)]

(B) Service Equipment.

In other than dwelling units, in addition to the requirements in (A), a permanent label shall be field or factory applied to service equipment 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 is prepared and applied in accordance with ~~acceptable industry practice~~ NFPA 70E .

Informational Note No. 1: *NFPA 70E*-2015, *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. 2: ANSI Z535.4-2011, *Product Safety Signs and Labels*, provides guidelines for the design of safety signs and labels for application to products.

Informational Note No. 3: Acceptable industry practices for equipment labeling are described in *NFPA 70E*-2015 *Standard for Electrical Safety in the Workplace*. 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 Input

The term “practices" is unenforceable as called out in the NEC Style Manual. The Style Manual states that this term shall not be used. This would extend to “industry practice.” Text replaced with the standard that outlines arc-flash calculations and marking.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 4063-NFPA 70-2017 [Section No. 706.7(D)]	

Submitter Information Verification

Submitter Full Name: MARVIN HAMON
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Public Input No. 644-NFPA 70-2017 [Section No. 110.16(B)]

(B) Service Equipment.

In other than dwelling units, in addition to the requirements in (A), a permanent label shall be field or factory applied to service equipment rated 1200 amps or more. The label shall be crafted by a qualified person and 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 is applied in accordance with acceptable industry practice.

Informational Note No. 1: *NFPA 70E*-2015, *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. 2: ANSI Z535.4-2011, *Product Safety Signs and Labels*, provides guidelines for the design of safety signs and labels for application to products.

Informational Note No. 3: Acceptable industry practices for equipment labeling are described in *NFPA 70E*-2015 *Standard for Electrical Safety in the Workplace*. 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 Input

The labeling in this section is a very serious code requirement and it should be clear in the code language that the label should not be crafted by an owner (layperson) or anyone other than a qualified person. Electrical inspectors do have issues with owners trying to do their own work, and this change would provide leverage to the electrical inspector so he can require that the individual who crafts the label be qualified in some manner.

Submitter Information Verification

Submitter Full Name: Nick Sasso
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Public Input No. 651-NFPA 70-2017 [Section No. 110.16(B)]

~~**(B)** Service Equipment.~~

~~In other than dwelling units, in addition to the requirements in (A), a permanent label shall be field or factory applied to service equipment 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 is applied in accordance with acceptable industry practice.*~~

~~Informational Note No. 1: *NFPA 70E* -2015, *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. 2: ANSI Z535.4-2011, *Product Safety Signs and Labels* , provides guidelines for the design of safety signs and labels for application to products.~~

~~Informational Note No. 3: Acceptable industry practices for equipment labeling are described in *NFPA 70E* -2015 *Standard for Electrical Safety in the Workplace* . 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 Input

This is a companion PI to PI-2155. PI-2155 seeks to consolidate all marking requirements for service equipment in one location to provide more clarity and usability to the NEC. This PI will delete section 110.16(B) and the text will be relocated to 110.24(B) in the companion public input.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2155-NFPA 70-2017 [Section No. 110.24]	

Submitter Information Verification

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Public Input No. 744-NFPA 70-2017 [Section No. 110.16(B)]

(B) Service Equipment.

In other than dwelling units, in addition to the requirements in (A), a permanent label shall be field or factory applied to service equipment ~~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 is applied in accordance with acceptable industry practice.

Informational Note No. 1: *NFPA 70E*-2015, *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. 2: ANSI Z535.4-2011, *Product Safety Signs and Labels*, provides guidelines for the design of safety signs and labels for application to products.

Informational Note No. 3: Acceptable industry practices for equipment labeling are described in *NFPA 70E*-2015 *Standard for Electrical Safety in the Workplace*. 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 Input

According to NFPA 70E, 2015 section 130.5(D), "Electrical equipment such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are in other than dwelling units and that are likely to require examination, adjustment, servicing, or maintenance while energized shall be field-marked with a label containing all of the following information: nominal system voltage, arc flash boundary, at least one of the following: available incident energy and the corresponding working distance, or the arc flash PPE category in Table 130.7(C)(15)(A)(b) or 130.7(C)(15)(B) for the equipment, but not both; minimum arc rating of clothing, site specific level of PPE."

Using Table 130.7(C)(15)(A)(b), an electrical worker could determine the proper level of PPE required for energized electrical work with the information required in NEC 110.16(B), regardless of amperage.

Electrical workers are commonly exposed to arc flash hazards when removing covers of service equipment, whether they are testing or troubleshooting or making modifications. Typically service equipment of any rating has the highest level of available fault current, therefore, the highest level of incident energy for the electrical system. This change would expand on existing requirements already in the NEC meant to make it easier for an electrical worker to select the proper PPE for the hazard involved. This change would better parallel with requirements already in NFPA 70E.

Submitter Information Verification

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Public Input No. 3436-NFPA 70-2017 [New Section after 110.22(B)]

TITLE OF NEW CONTENT

For more information, see IEEE 3003.2 Recommended Practice for Equipment Grounding and Bonding in Industrial and Commercial Power Systems

Statement of Problem and Substantiation for Public Input

Series circuit breaker ratings have subtleties that should be informed by faster-moving engineering considerations available in the new IEEE 3000 series of recommended practices. This document is one of several that replaces content in IEEE 142 -- the so-called “Green Book” -- which has been sunsetted and superseded by 3003.2.

IEEE 3000 Standards Collection™ is the trademarked name of the family of industrial and commercial power systems standards formerly known as IEEE Color Books. The IEEE 3000 Standards Collection overall includes the same content as the Color Books that have been referenced into previous editions of the NEC but is now organized into approximately 70 IEEE “dot” standards that cover specific technical topics.

This method of development, of capturing and quickly conveying leading practice from transactions among academic experts and practitioners into our industry, supports the NFPA International mission of eliminating death, injury, property and economic loss due to fire, electrical and related hazards. My own experience with other international electrical standard developers suggests that closer coupling of the fire and electrical safety community in the US would be welcomed.

Details about this document is available at the link below:

https://standards.ieee.org/findstds/standard/3003.2-2014.html

Submitter Information Verification

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Submittal Date:	Wed Sep 06 07:59:38 EDT 2017

Public Input No. 2993-NFPA 70-2017 [New Section after 110.26(A)(1)]

Informational Note: All though certain equipment may not reguarly require examination, ajustment,servicing, or maintenance while energized, infrared thermographic inspection is often required at facilities on all equipment containing bolted terminations.

Statement of Problem and Substantiation for Public Input

Low voltage dry transformers are often considered by an AHJ as a piece of equipment that will NOT LIKELY require examination, adjustment, servicing, or maintenance while energized. I have seen many project specifications requiring infrared thermographic scans on low voltage dry transformers. Some times the request is for 4 separate scans to be performed in the first year following substantial completion of the building. I feel that with this fairly "new" aspect (IR scanning) of the industry that at least a reminder (informational note) to the depth of working space and a consideration when installing a dry transformer should be stated in 110.26. I agree with the AHJ that traditionally in the past a dry type transformer wouldn't have required this consideration and wouldn't be worked on in an energized state. I have seen installations of dry transformers installed above accessible ceilings; which is permitted per 450.13(B) and once the transformer is hung in the ceiling many other trades material/ equipment (ductwork, piping, etc.) clutter that depth of working space in front of the equipment.

Submitter Information Verification

Submitter Full Name: Chris Gabriele
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Submittal Date: Wed Aug 30 13:21:55 EDT 2017

Public Input No. 3895-NFPA 70-2017 [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 all electrical equipment. Minimum circuit ampacity and maximum overcurrent protection markings shall be provided for uninterruptible power supplies, AC and DC power supplies, and conversion equipment. Other markings that indicate voltage, current, wattage, or other ratings shall be provided as specified elsewhere in this *Code*. The marking or label shall be of sufficient durability to withstand the environment involved.

Statement of Problem and Substantiation for Public Input

"Other markings" included in NEC 110.21(A) (1) are not consistent throughout NEC Chapter 4 equipment articles or product standards. Additionally, a number of products exist that are not specifically covered by any Chapter 4 Article of the NEC (UPS, Power Supplies [DC and AC], and conversion equipment). At this point neither the NEC nor Product Standards include uniform marking of these products that simply inform designers, installers, and AHJ's how to select circuit and overcurrent protection sizes. Those sizes vary in many cases. Minimum circuit ampacity (MCA) and maximum overcurrent protection (MOP) markings are a simple and useful tool in the field. Product standards could address any internal conditions of the equipment and any NEC requirements that impact the values.

Submitter Information Verification

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Public Input No. 1039-NFPA 70-2017 [Section No. 110.21(A)(2)]

(2) Reconditioned Equipment.

Reconditioned equipment shall be marked with the name, trademark, or other descriptive marking by which the organization responsible for reconditioning the electrical equipment can be identified, along with the date of the reconditioning.

Reconditioned equipment shall be identified as “reconditioned” and approval of the reconditioned equipment shall not be based solely on the equipment’s original listing.

Exception: In industrial occupancies, where conditions of maintenance and supervision ensure that only qualified persons service the equipment, the markings indicated in 110.21(A)(2) shall not be required for equipment that is reconditioned by the owner/operator as part of a regular equipment maintenance program ..

Informational Note: Industry standards are available for application of reconditioned and refurbished equipment. Normal servicing of equipment that remains within a facility should not be considered reconditioning or refurbishing.

Statement of Problem and Substantiation for Public Input

The intent of the Exception to 110.21(A)(2) is to provide relief from the marking requirement when industrial facilities “maintain and refurbish equipment as a part of their regularly maintenance cycle for safety and reliability” (wording from the Committee Statement). The unintended result of the wording in the Exception is that equipment that is reconditioned by a company not associated with the industrial facility is not required to be marked. The proposed wording would address this oversight.

Submitter Information Verification

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Zip:
Submittal Date: Fri Jun 16 11:42:16 EDT 2017

Public Input No. 1040-NFPA 70-2017 [Section No. 110.21(A)(2)]

(2) Reconditioned Equipment.

Reconditioned equipment shall be marked with the name, trademark, or other descriptive marking by which the organization responsible for reconditioning the electrical equipment can be identified, along with the date of the reconditioning.

Reconditioned equipment shall be identified as “reconditioned” and approval of the reconditioned equipment shall not be based solely on the equipment’s original listing.

Exception: In industrial occupancies, where conditions of maintenance and supervision ensure that only qualified persons service the equipment, the markings indicated in 110.21(A)(2) shall not be required.

Informational Note No. 1 : Industry standards are available for application of reconditioned and refurbished equipment. Normal servicing of equipment that remains within a facility should not be considered reconditioning or refurbishing.

Informational Note No. 2: For the purpose of this requirement, the term "reconditioned" is a term that is interchangeable with the terms "rebuilt", "refurbished", "renovated", or "remanufactured".

Statement of Problem and Substantiation for Public Input

There are multiple variations of “reconditioned equipment”. The marking requirements in 110.21(A) should also apply in the case of equipment being “rebuilt”, refurbished”, “renovated”, or “remanufactured”. Noting in an informational note that these terms are interchangeable ensures the requirement is not narrowly limited to claims of “reconditioned” equipment. It also allows the marking specified in 110.21(A)(2), second paragraph, to be tailored to each of these variations.

Submitter Information Verification

Submitter Full Name: Robert Osborne
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jun 16 11:53:43 EDT 2017

Copyright Assignment

I, Robert Osborne, hereby irrevocably grant and assign to the National Fire Protection Association (NFPA) all and full rights in copyright in this Public Input (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 Input in this or another similar or derivative form is used. I hereby warrant that I am the author of this Public Input and that I have full power and authority to enter into this copyright assignment.

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Public Input No. 2935-NFPA 70-2017 [Section No. 110.21(A)(2)]

(2) Reconditioned Equipment.

Reconditioned equipment shall be marked with the name, trademark, or other descriptive marking by which the organization responsible for reconditioning the electrical equipment can be identified, along with the date of the reconditioning.

Reconditioned equipment shall be ~~identified~~ listed as "reconditioned" and ~~approval~~ original listing marks removed. Approval of the reconditioned equipment shall not be based solely on the equipment's original listing.

Exception: In industrial occupancies, where conditions of maintenance and supervision ensure that only qualified persons service the equipment, the markings indicated in 110.21(A)(2) shall not be required.

Informational Note: Industry standards are available for application of reconditioned and refurbished equipment. Normal servicing of equipment that remains within a facility should not be considered reconditioning or refurbishing.

Statement of Problem and Substantiation for Public Input

The presence of the original certification mark on reconditioned equipment suggest to the installer and AHJ that the equipment is compliant with the product safety standard related to that equipment. In reality the actual compliance with the related safety standard is unknown. Third party NRTL certification bodies can offer listing and labeling services to determine compliance of rebuilt, refurbished or reconditioned electrical equipment to related safety standards. Throughout the NEC reference to equipment being listed is made. The use of reconditioned equipment cannot negate this. The level of safety of installed equipment must be the same whether the equipment installed is new or reconditioned.

Submitter Information Verification

Submitter Full Name: Donald Talka
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 29 11:33:09 EDT 2017

Public Input No. 4356-NFPA 70-2017 [Section No. 110.21(A)(2)]

(2) Reconditioned Equipment.

Reconditioned equipment shall be marked with the name, trademark, or other descriptive marking by which the organization responsible for reconditioning the electrical equipment can be identified, along with the date of the reconditioning.

Reconditioned equipment shall be identified as “reconditioned” and approval of the reconditioned equipment shall not be based solely on the equipment’s original listing.

Exception: In industrial occupancies, where conditions of maintenance and supervision ensure that only qualified persons service the equipment, the markings indicated in 110.21(A)(2) shall not be required.

Informational Note: Industry standards are available for application of reconditioned and refurbished equipment. Industry Standards such as (PEARL EERS) Professional Electrical Apparatus Reconditioning League ELECTRICAL EQUIPMENT RECONDITIONING STANDARD for Electrical Apparatus and Equipment used in Commercial and Industrial Applications. Normal servicing of equipment that remains within a facility should not be considered reconditioning or refurbishing.

Statement of Problem and Substantiation for Public Input

referencing the electric equipment standard for electrical Electrical Apparatus and Equipment used in Commercial and Industrial Applications PEARL EERS would allow the industry a reference to reconditioning standards for equipment.

Submitter Information Verification

Submitter Full Name: Howard Herndon
Organization: South West Electritech Service
Street Address:
City:
State:
Zip:
Submittal Date: Thu Sep 07 23:53:34 EDT 2017

Public Input No. 303-NFPA 70-2017 [Section No. 110.21(B)]

(B) Field-Applied Hazard Markings.

Where caution, warning, or danger signs or labels are required by this *Code*, the labels shall meet the following requirements:

(1) The marking shall warn of the hazards using effective words, colors, symbols, or any combination thereof.

Informational Note: ANSI Z535.4-2011, *Product Safety Signs and Labels* , provides guidelines for suitable font sizes, words, colors, symbols, and location requirements for labels. OSHA CFR-29 1910.145-2015, Specifications for accident prevention signs and tags.

(2) The label shall be permanently affixed to the equipment or wiring method and shall not be handwritten.

Exception to (2): Portions of labels or markings that are variable, or that could be subject to changes, shall be permitted to be handwritten and shall be legible.

(3) The label shall be of sufficient durability to withstand the environment involved.

Informational Note: ANSI Z535.4-2011, *Product Safety Signs and Labels*, provides guidelines for the design and durability of safety signs and labels for application to electrical equipment. OSHA CFR-29 1910.145-2015, OSHA (Occupational Safety and Health Act) requirements for accident prevention signs and tags.

Statement of Problem and Substantiation for Public Input

ANSI Z535.4-2011 is a (standard) for the design and durability of safety signs and labels while OSHA provides the (code) requirements as related to worker safety signage. Both are valuable tools for proper sign design, but code compliance will be more critical going forward as the insurance and financial industries become more involved with PV.

Submitter Information Verification

Submitter Full Name: Todd Fries
Organization: HellermannTyton
Affilliation: I am a member of CMP-4
Street Address:
City:
State:
Zip:
Submittal Date: Mon Feb 27 10:44:13 EST 2017

Public Input No. 304-NFPA 70-2017 [Section No. 110.21(B)]

(B) Field-Applied Hazard Markings.

Where caution, warning, or danger signs or labels are required by this *Code*, the labels shall meet the following requirements:

(1) The marking shall warn of the hazards using effective words, colors, symbols, or any combination thereof.

Informational Note: ANSI Z535.4-2011, *Product Safety Signs and Labels* , provides guidelines for suitable font sizes, words, colors, symbols, and location requirements for labels.

(2) The label shall be permanently affixed to the equipment or wiring method and shall not be handwritten.

Exception to (2): Portions of labels or markings that are variable, or that could be subject to changes, shall be permitted to be handwritten and shall be legible. When used outdoors and exposed to UV light, the use of a paint-pen with a transparent UV stable laminate is preferred to ensure a longer outdoor life.

(3) The label shall be of sufficient durability to withstand the environment involved.

Informational Note: ANSI Z535.4-2011, *Product Safety Signs and Labels*, provides guidelines for the design and durability of safety signs and labels for application to electrical equipment.

Additional Proposed Changes

File Name	Description	Approved
Paint_Pen_vs_Sharpie_UV_tests.pdf	These are the test results showing how a standard Sharpie and an Industrial grade sharpie fade quickly in sunlight, even with a UV stable clear laminate. If we are allowing hand written warnings in outdoor environements (i.e. Solar) they should use a paint-pen with UV stable clear laminate when used outdoors.	✓

Statement of Problem and Substantiation for Public Input

The use of a Sharpie pen will fade in a short amount of time. If hand-writing is allowed, the installers should be directed toward a commercially available paint pen, which can be sealed under a clear UV stable laminate to extend print life. Xenon Arc tests have proved a standard Sharpie pen will fade in under a year while a laminated paint pen will last as much as 10X longer.

Submitter Information Verification

Submitter Full Name: Todd Fries
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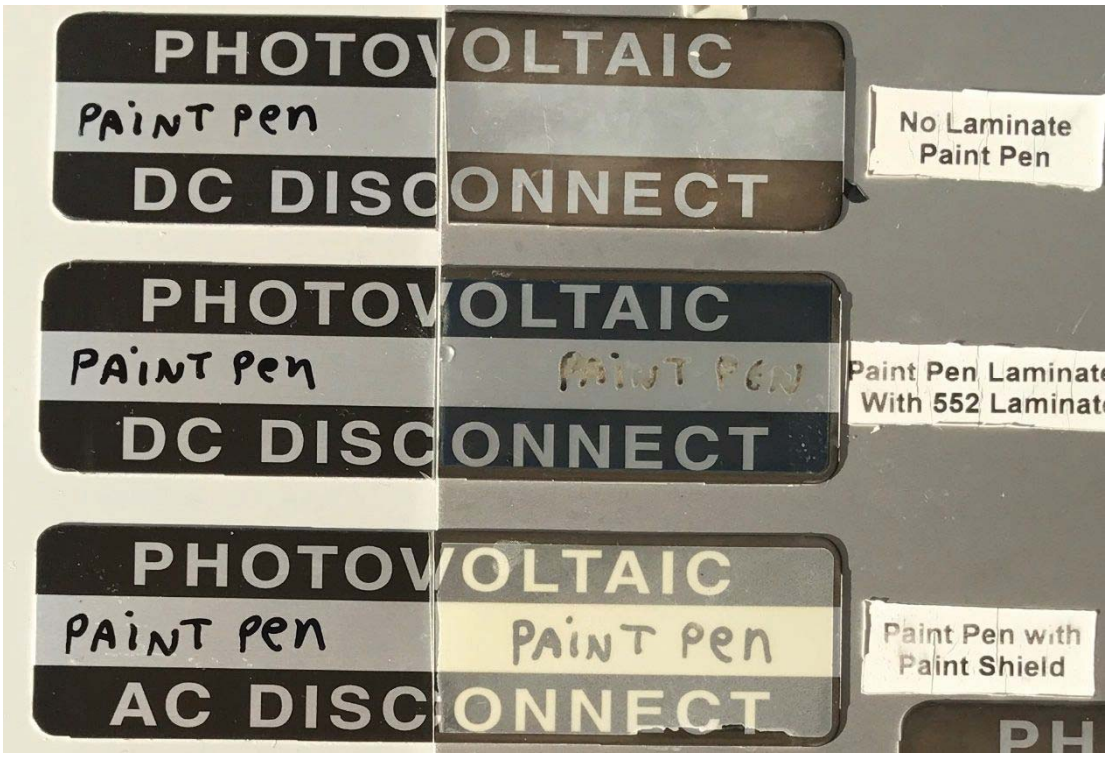
Submittal Date: Mon Feb 27 10:58:33 EST 2017

Copyright Assignment

I, Todd Fries, hereby irrevocably grant and assign to the National Fire Protection Association (NFPA) all and full rights in copyright in this Public Input (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 Input in this or another similar or derivative form is used. I hereby warrant that I am the author of this Public Input and that I have full power and authority to enter into this copyright assignment.

☑ By checking this box I affirm that I am Todd Fries, 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

Paint Pen Metal Solar Placard



unexposed

Exposed

9340 Hours on right.
0 hours on left.

No visible fading of Metal Solar Placard.

However, unprotected paint pen has faded completely. The ink covered by the standard laminate is continuing to fade, but the ink protected by the UV stable transparent paint shield does not show signs of fading.

9340 hours is equivalent to 14.97 Florida sun years

Industrial Sharpie Solar Placard

Exposed Unexposed

0 Hours on right.
1467 hours on left.

Sharpie is almost gone. The placard itself shows no signs of fading.

1467 hours is equivalent to 2.35 Florida sun years

Exposed Unexposed

0 Hours on right.
2711 hours on left.

Sharpie has faded completely. The placard itself shows no signs of fading.

2711 hours is equivalent to 4.34 Florida sun years

Sharpie pen has already faded after only 1467 Xenon Arc test hours. See upper left hand side.

Sharpie Pens on standard pre-printed solar labels

After only 1400 hours of
Xenon Arc Exposure
Showing both laminated
and un-laminated results.

Public Input No. 3323-NFPA 70-2017 [Section No. 110.21(B)]

(B) Field-Applied Hazard Markings.

Where caution, warning, or danger signs or labels are required by this *Code*, the labels shall meet the following requirements:

(1) The marking shall warn of the hazards using effective words, colors, symbols, or any combination thereof.

Informational Note: ANSI Z535.4-2011, *Product Safety Signs and Labels* , provides guidelines for suitable font sizes, words, colors, symbols, and location requirements for labels.

(2) The label shall be permanently affixed to the equipment or wiring method and shall not be handwritten.

Exception to (2):

~~Portions~~

For installations not exposed to the weather; portions of labels or markings that are variable, or that could be subject to changes, shall be permitted to be handwritten and shall be legible.

(3) The label shall be of sufficient durability to withstand the environment involved.

Informational Note: ANSI Z535.4-2011, *Product Safety Signs and Labels*, provides guidelines for the design and durability of safety signs and labels for application to electrical equipment.

Statement of Problem and Substantiation for Public Input

When exposed to the weather and sunlight, handwritten values done with a permanent marker or ink pen fade from the label within months of the installation. An electrical safety hazard exists for individuals servicing the installation when important information is not known or provided.

Submitter Information Verification

Submitter Full Name: Dean Hunter
Organization: Minnesota Department of Labor
Street Address:
City:
State:
Zip:
Submittal Date: Tue Sep 05 14:00:34 EDT 2017

Public Input No. 1784-NFPA 70-2017 [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. ~~The~~ In other than one- or two-family dwellings, the marking must include the identification designation of the circuit source panelboard that supplies the disconnecting means. The marking shall be of sufficient durability to withstand the environment involved.

Statement of Problem and Substantiation for Public Input

Identifying the source of of a circuit or feeder at the disconnecting enclosure will bring it in line with 408.4, identify the source for panelboards. The identification at disconnects will promote safety. The maintenance electrician, contract electrician or owner will be able to shut off the disconnect in case of a problem with a minimal amount of time.

Submitter Information Verification

Submitter Full Name: Roger Chick
Organization: ETI - Training Electricians
Affilliation: IAEI member
Street Address:
City:
State:
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Submittal Date: Fri Aug 04 16:37:45 EDT 2017

Origin (from sources other than the submitter)

State of Washington Administrative Code (WAC rules) 296.46B.122 (3) In other than dwelling units, the identification plate must include the identification designation of the circuit source panelboard that supplies the disconnecting means. Page 15 NEC 2014 408.4(B) I used: one- or two-family dwellings in place of "dwelling units"

Public Input No. 3714-NFPA 70-2017 [New Section after 110.3]

110.3(D) Field Evaluation. **Field evaluations shall be performed by a recognized Field Evaluation Body (FEB) and shall be performed in accordance with applicable product standards recognized as achieving equivalent and effective safety for equipment installed to comply with this *Code*. Where one-of-a-kind, limited production, used, modified or reconditioned electrical equipment is installed, the authority having jurisdiction shall be permitted to require a field evaluation as evidence of compliance.**

Exception: This requirement shall not apply to:

(1) Preventive maintenance for electrical equipment.

(2) Where listed retrofit kits or other listed modifications are installed per the manufacturers installation instructions.

Informational Note 1: NFPA 70B, Standard for Recommended Practice for

Electrical Equipment Maintenance can be used as a basis for determining preventative maintenance applications.

Informational Note 2; NFPA 790, Standard for Competency of Third-Party Field Evaluation Bodies, can be used to qualify a Field Evaluation Body (FEB). NFPA 791, Recommended Practice and Procedures for Unlabeled Electrical Equipment Evaluation, can be used to determine the minimum requirements of a field evaluation for one-of-a-kind, limited production, used, modified or reconditioned electrical equipment in accordance with nationally recognized standards and any requirements of the AHJ.

Statement of Problem and Substantiation for Public Input

The 2017 NEC added a new Section 110.21(A)(2) which states that the approval of reconditioned equipment shall not be based solely on the equipment's original listing. As per any of the NRTLs, the original listing mark is the manufacturer's declaration that a product was manufactured in accordance with the applicable certification requirements, and was in compliance with those requirements when it was shipped from the factory. When a product bearing an original listing mark is modified or rebuilt (including being refurbished, remanufactured, reconditioned or renovated) after it leaves the original factory, the AHJ may not have all the necessary resources to fully evaluate the equipment as required by Section 110.3(A). A field evaluation from an approved FEB (Field Evaluation Body) should be permitted as an alternative method to assist the AHJ in approving the installation.
This would be similar to Section 110.3(C) permitting third party product certifications as the basis for approval of equipment.
This would be similar to Section 90.7 permitting the product listing as the basis for approval of the equipment
Section 90.7 provides a basis for electrical equipment approval provided the equipment has been listed by a qualified electrical testing laboratory. This section even states that the reason to permit listed equipment as a basis for approval is avoid 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. This new Section 110.3(D) would provide the AHJ with an alternate method for equipment approval where field modifications to the original product listing are not otherwise able to be readily verified for compliance with applicable requirements.

Submitter Information Verification

Submitter Full Name: Richard Hollander
Organization: City of Tucson
Street Address:
City:
State:
Zip:

Submittal Date: Wed Sep 06 18:13:11 EDT 2017

Copyright Assignment

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Public Input No. 3346-NFPA 70-2017 [Section No. 110.22(B)]

~~**(B)** Engineered Series Combination Systems.~~

~~Equipment enclosures for circuit breakers or fuses applied in compliance with series combination ratings selected under engineering supervision in accordance with 240.86(A) shall be legibly marked in the field as directed by the engineer to indicate the equipment has been applied with a series combination rating. The marking shall meet the requirements in 110.21(B) and shall be readily visible and state the following:~~

~~CAUTION — ENGINEERED SERIES COMBINATION SYSTEM RATED _____ AMPERES. IDENTIFIED REPLACEMENT COMPONENTS REQUIRED.~~

Statement of Problem and Substantiation for Public Input

Remove and relocate 110.22(B) to 240.86(A).
110.22(B) is located in Part I of Article 110 which provides general requirements. The marking required in this section is not general at all but is rather specific to one unique type of installation only mentioned in Section 240.86 of the NEC. It would make sense to have all requirements related to series rated electrical systems located in 240.86 including the marking requirements currently found in 110.22(B).
A companion proposal will be sent to CMP 10 to add the language being deleted from 110.22(B) to 240.86(A).

Submitter Information Verification

Submitter Full Name: Jeff Simpson
Organization: Underwriters Laboratories
Street Address:
City:
State:
Zip:
Submittal Date: Tue Sep 05 15:43:39 EDT 2017

Public Input No. 1014-NFPA 70-2017 [Section No. 110.22(C)]

(C) Tested Series Combination Systems.

Equipment enclosures for circuit breakers or fuses applied in compliance with the series combination ratings marked on the equipment by the manufacturer in accordance with 240.86(B) shall be legibly marked in the field to indicate the equipment has been applied with a series combination rating. The marking shall meet the requirements in 110.21(B) and shall be readily visible and state the following:

CAUTION — SERIES COMBINATION SYSTEM RATED ____ AMPERES. MAXIMUM MOTOR LOAD CONTRIBUTION ALLOWED IS _____ AMPERES. IDENTIFIED REPLACEMENT COMPONENTS REQUIRED.

Informational Note: See IEEE 3004.5-2014 *Recommended Practice for the Application of Low-Voltage Circuit Breakers in Industrial and Commercial Power Systems*, for further information on series tested systems.

Statement of Problem and Substantiation for Public Input

I have been an commercial electrical inspector for 16 years. Our Utility company, which is in 8 states (Xcel) uses very low impedance transformers (Z=1.6% for all transformers under 750kva) Therefore, I see series rating systems around 50% of the time. As common as it is, there is still a major lack of education among installers, engineers and inspectors on what series rating is and when it can and cannot be used. A good place to start would be to include motor load contribution restrictions in 110.22. I see on a regular basis that an engineer will series rate a "core & shell" building when there is only unit heaters for the sprinkler lines. Its all well & good until it gets build out. Now, here comes the roof top units, compressors, pumps, which can include single feed elevator motors. Service electricians and any remodel would also benefit greatly. If we are lucky enough to get the stickers required by 110.22 there is "nothing" stating what is the motor load contribution or how much motor loads can be added if any. Putting this additional language in would be extremely beneficial, 1st off it would be taught & hopefully explained for those who go through the 2020 NEC changes. That alone would be huge, also as a byproduct would be that it is a blank line that has to be filled in the field that would educate inspectors, installers & ultimately engineers, similarly to what NEC 110.
24 has done for the industry. I can tell you, that this would be a strong change with no hardship to the project. I realize CMP1 can respond, that this is already covered in NEC 240.86 my response to that is that i agree but its not understood.

Submitter Information Verification

Submitter Full Name: James Dorsey
Organization: Douglas County Electrical Insp
Street Address:
City:
State:
Zip:
Submittal Date: Sat Jun 10 18:13:46 EDT 2017

Public Input No. 3347-NFPA 70-2017 [Section No. 110.22(C)]

~~**(C)** Tested Series Combination Systems.~~

~~Equipment enclosures for circuit breakers or fuses applied in compliance with the series combination ratings marked on the equipment by the manufacturer in accordance with 240.86(B) shall be legibly marked in the field to indicate the equipment has been applied with a series combination rating. The marking shall meet the requirements in 110.21(B) and shall be readily visible and state the following:~~

~~CAUTION — SERIES COMBINATION SYSTEM RATED ____ AMPERES. IDENTIFIED REPLACEMENT COMPONENTS REQUIRED.~~

~~Informational Note: See IEEE 3004.5-2014 *Recommended Practice for the Application of Low-Voltage Circuit Breakers in Industrial and Commercial Power Systems* , for further information on series tested systems.~~

Statement of Problem and Substantiation for Public Input

Remove and relocate 110.22(C) to 240.86(B).
110.22(C) is located in Part I of Article 110 which provides general requirements. The marking required in this section is not general at all but is rather specific to one unique type of installation only mentioned in Section 240.86 of the NEC. It would make sense to have all requirements related to series rated electrical systems located in 240.86 including the marking requirements currently found in 110.22(C).
A companion proposal will be sent to CMP 10 to add the language being deleted from 110.22(C) to 240.86(B).

Submitter Information Verification

Submitter Full Name: Jeff Simpson
Organization: Underwriters Laboratories
Street Address:
City:
State:
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Submittal Date: Tue Sep 05 15:49:06 EDT 2017

Public Input No. 1542-NFPA 70-2017 [Section No. 110.24]

110.24 Available Fault Current.

(A) Field Marking.

Service ~~equipment at other than~~ equipment including dwelling units ~~shall be legibly marked~~ and multi-family shall be legiby marked in the field with the maximum 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: The available fault-current marking(s) addressed in 110.24 is related to required short-circuit current ratings of equipment. *NFPA 70E*-2015, *Standard for Electrical Safety in the Workplace,* provides assistance in determining the severity of potential exposure, planning safe work practices, and selecting personal protective equipment.

(B) Modifications.

When modifications to the electrical installation occur that affect the maximum available fault current at the service, the maximum available fault current shall be verified or recalculated as necessary to ensure the service equipment ratings are sufficient for the maximum available fault current at the line terminals of the equipment. The required field marking(s) in 110.24(A) shall be adjusted to reflect the new level of maximum available fault current.

Exception: The field marking requirements in 110.24(A) and 110.24(B) shall not be required in industrial installations where conditions of maintenance and supervision ensure that only qualified persons service the equipment.

Statement of Problem and Substantiation for Public Input

City of Portsmouth have reached high levels of fault current due to large pad mounted, and pole mounted transformer feeding dwelling units and commercial building.
110.24 should apply to dwelling units also.
It not uncommon to see levels at 100 K

Submitter Information Verification

Submitter Full Name: John Plourde
Organization: City of Portsmouth NH Electrical Department
Affilliation: City of Portsmouth NH
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 01 17:39:35 EDT 2017

Public Input No. 2155-NFPA 70-2017 [Section No. 110.24]

110.24 ~~– Available Fault Current.~~ 24 **Service Equipment**

(A)

~~– Field Marking.~~

Available Fault Current

Service equipment at other than dwelling units shall be legibly marked in the field with the maximum available fault current at the supply terminals of the service overcurrent protective device(s). 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: The available fault-current marking(s) addressed in 110.24 is related to required short-circuit current ratings of equipment. *NFPA 70E*-2015, *Standard for Electrical Safety in the Workplace,* provides assistance in determining the severity of potential exposure, planning safe work practices, and selecting personal protective equipment.

(B) – **Equipment 1200 amps and larger.**

In addition to the requirements in (A), a permanent arc flash label installed in accordance with acceptable industry practice shall be field or factory applied to service equipment rated 1200 amps or more.

Informational Note No. 1: NFPA 70E -2015, 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. 2: ANSI Z535.4-2011, Product Safety Signs and Labels, provides guidelines for the design of safety signs and labels for application to products.

Informational Note No. 3: Acceptable industry practices for equipment labeling are described in NFPA 70E -2015 Standard for Electrical Safety in the Workplace. This standard provides specifc

criteria for developing arc-fash labels for equipment that provides nominal system voltage, incident energy levels, arc-flash boundaries, minimum required levels of personal protective equipment, and so forth.

(C) Modifications.

When modifications to the electrical installation occur that affect the maximum available fault current at the service, the maximum available fault current shall be verified or recalculated as necessary to ensure the service equipment ratings are sufficient for the maximum available fault current at the line terminals of the equipment. The required field marking(s) in 110.24(A) shall be adjusted to reflect the new level of maximum available fault current. The required field marking in 110.24(B), if applicable, shall also be verified or recalculated.

Exception: The field marking requirements in 110.24(A) and 110.24(B) shall not be required in industrial installations where conditions of maintenance and supervision ensure that only qualified persons service the equipment.

Statement of Problem and Substantiation for Public Input

This is a companion public input to PI-651 with editorial changes and one major change to the arc flash labeling requirements.

The editorial changes proposed would provide additional clarity to the NEC by grouping all service equipment marking requirements to one location in the code. The proposed editorial changes are as follows:

1. The title to 110.24 "Available Fault Current" would be changed to "Service Equipment".
2. The title to the first level subdivision (A) is changed to "Available Fault Current".
3. The first level subdivision (B) Modifications is being changed to (C).
4. A new first level subdivision (B) is added and titled "Equipment 1200 amps and larger". Text that deals with arc flash labeling for equipment 1200 amps in 110.16 is relocated to 110.24(C).

Technical changes are as follows:
1. The text "supply terminals of the service overcurrent protective device(s)" is added to (A) since this would provide clarity to the user of the NEC that the fault current calculation must be made at the supply terminals and not just simply service equipment.
2. A change is being proposed to eliminate the clearing time option for arc flash labeling.

The clearing time option in 2017, as written, lacks clarity and is open for much misinterpretation and confusion. This confusion and misinterpretation is for several reasons. First the clearing time for more than one service overcurrent device within one enclosure can be misleading and not useful. How does the user complete the marking requirement in this case. Second, clearing time is a value that is most affected be the condition of the breaker, maintenance, and does not provide any immediate safety information to the user of the code. Because of these reasons it would be better to require the user of the code to just simply place an arc flash label on service equipment in accordance with an industry standard, namely NFPA 70e. This will be a much better approach than the 2017 method.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 651-NFPA 70-2017 [Section No. 110.16(B)]	

Submitter Information Verification

Submitter Full Name: David Hittinger
Organization: Independent Electrical Contractors
Affilliation: Independent Electrical Contractors Codes and Standard
Street Address:
City:
State:
Zip:
Submittal Date: Sun Aug 13 10:44:23 EDT 2017

Public Input No. 1249-NFPA 70-2017 [Section No. 110.24(A)]

(A) Field Marking.

Service equipment at other than dwelling units shall be legibly marked in the field with the ~~maximum~~ 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: The available fault-current marking(s) addressed in 110.24 is related to required short-circuit current ratings of equipment. *NFPA 70E*-2015, *Standard for Electrical Safety in the Workplace,* provides assistance in determining the severity of potential exposure, planning safe work practices, and selecting personal protective equipment.

Statement of Problem and Substantiation for Public Input

The Fault Current Working Group was formed to support the Correlating Committee's Usability Task Group. Members of the Fault Current Working Group included Scott Blizard, Jim Dollard, Carl Fredericks, Jeff Hidaka, Chris Jensen, Alan Manche, and Vince Saporita. The goal of the Fault Current Working Group was to analyze the usage of the terms "short-circuit" and "fault" throughout the NEC, and submit Public Inputs, as appropriate, to improve clarity, consistency, and usability.

While "short-circuit" and "fault" have been used interchangeably throughout the NEC (and the whole electrical industry), there are subtle differences between the two. This has resulted in confusion and a lack of consistency. Thus, numerous related Public Inputs have been submitted by the Working Group.

The definition of "Fault Current, Available (Available Fault Current)" is taken from SR8 of NFPA70E-2018. The definition ("The largest amount of current capable of being delivered at a point on the system during a short-circuit condition") clarifies that "available fault current" is the highest short-circuit current that can flow at a particular point in the electrical system. The Informational Note, also taken from SR8 of NFPA70E-2018, ("A short-circuit can occur during abnormal conditions such as a fault between circuit conductors or a ground fault. See Figure 100.0") provides an example of the relationship between "short-circuit" and "fault". Figure 100.0, also from SR8 of NFPA70E-2018, helps explain the difference between "available fault current", "short-circuit current rating", and "interrupting rating".

"Available short-circuit current" and "short-circuit current" are changed to "available fault current" for improved consistency.

"Maximum" is deleted in front of "maximum available fault current" (and "maximum available short-circuit current") because the new definition of "available fault current" clearly includes the maximum (largest). The only exceptions, which remain unchanged, are in 250.4(A)(5) and 250.4(B)(3), where the word "maximum" is still appropriate and is necessary for a complete understanding of the requirement.

Equipment and component fault current ratings, short-circuit ratings, and short-circuit withstand ratings are changed to "short-circuit current ratings", in agreement with equipment and component listing standards. The only exceptions, which remain unchanged, are for switch "fault closing ratings", also to be in agreement with existing equipment and component listing standards.

Finally, "Short-circuit current calculation" is replaced with "available fault current calculation", improving consistency.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 1246-NFPA 70-2017 [Definition: Coordination, Selective (Selective Coordination...]	PI from Fault Current Working Group
Public Input No. 1247-NFPA 70-2017 [New Definition after Definition: Externally Operable.]	PI from Fault Current Working Group
Public Input No. 1248-NFPA 70-2017 [New Definition after Definition: Externally Operable.]	PI from Fault Current Working Group
Public Input No. 1250-NFPA 70-2017 [Section No. 110.24(B)]	PI from Fault Current Working Group
Public Input No. 1251-NFPA 70-2017 [Section No. 225.52(B)]	PI from Fault Current Working Group

Public Input No. 1252-NFPA 70-2017 [Section No. 230.82]	PI from Fault Current Working Group
Public Input No. 1253-NFPA 70-2017 [Section No. 230.205(B)]	PI from Fault Current Working Group
Public Input No. 1254-NFPA 70-2017 [Section No. 368.258]	PI from Fault Current Working Group
Public Input No. 1255-NFPA 70-2017 [Section No. 430.99]	PI from Fault Current Working Group
Public Input No. 1256-NFPA 70-2017 [Section No. 445.11]	PI from Fault Current Working Group
Public Input No. 1257-NFPA 70-2017 [Section No. 480.7(D)]	PI from Fault Current Working Group
Public Input No. 1258-NFPA 70-2017 [Section No. 490.21(A)(4)]	PI from Fault Current Working Group
Public Input No. 1259-NFPA 70-2017 [Section No. 490.21(B)(2)]	PI from Fault Current Working Group
Public Input No. 1260-NFPA 70-2017 [Section No. 490.21(C)(3)]	PI from Fault Current Working Group
Public Input No. 1263-NFPA 70-2017 [Section No. 490.21(D)(2)]	PI from Fault Current Working Group
Public Input No. 1264-NFPA 70-2017 [Section No. 490.21(D)(4)]	PI from Fault Current Working Group
Public Input No. 1265-NFPA 70-2017 [Section No. 490.21(E) [Excluding any Sub-Sections]]	PI from Fault Current Working Group
Public Input No. 1266-NFPA 70-2017 [Section No. 440.10(B)]	PI from Fault Current Working Group
Public Input No. 1267-NFPA 70-2017 [Section No. 505.7(F)]	PI from Fault Current Working Group
Public Input No. 1271-NFPA 70-2017 [Section No. 545.13]	PI from Fault Current Working Group
Public Input No. 1272-NFPA 70-2017 [Section No. 550.15(K)]	PI from Fault Current Working Group
Public Input No. 1273-NFPA 70-2017 [Section No. 551.47(O)]	PI from Fault Current Working Group
Public Input No. 1274-NFPA 70-2017 [Section No. 552.48(N)]	PI from Fault Current Working Group
Public Input No. 1275-NFPA 70-2017 [Section No. 620.16(B)]	PI from Fault Current Working Group
Public Input No. 1276-NFPA 70-2017 [Section No. 620.51(D)(2)]	PI from Fault Current Working Group
Public Input No. 1277-NFPA 70-2017 [Sections 670.5(1), 670.5(2)]	PI from Fault Current Working Group
Public Input No. 1281-NFPA 70-2017 [Section No. 690.8(A)(1)]	PI from Fault Current Working Group
Public Input No. 1282-NFPA 70-2017 [Section No. 690.8(D)]	PI from Fault Current Working Group
Public Input No. 1283-NFPA 70-2017 [Section No. 690.9(A)]	PI from Fault Current Working Group
Public Input No. 1284-NFPA 70-2017 [Section No. 690.13(E)]	PI from Fault Current Working Group
Public Input No. 1285-NFPA 70-2017 [Section No. 690.15(B)]	PI from Fault Current Working Group

Public Input No. 1286-NFPA 70-2017 [Section No. 690.32]	PI from Fault Current Working Group
Public Input No. 1287-NFPA 70-2017 [Section No. 695.6(I)]	PI from Fault Current Working Group
Public Input No. 1288-NFPA 70-2017 [Section No. 700.4(A)]	PI from Fault Current Working Group
Public Input No. 1289-NFPA 70-2017 [Section No. 701.4]	PI from Fault Current Working Group
Public Input No. 1290-NFPA 70-2017 [Section No. 702.4(A)]	PI from Fault Current Working Group
Public Input No. 1291-NFPA 70-2017 [Section No. 705.22]	PI from Fault Current Working Group
Public Input No. 1292-NFPA 70-2017 [Section No. 705.31]	PI from Fault Current Working Group
Public Input No. 1293-NFPA 70-2017 [Section No. 705.65(A)]	PI from Fault Current Working Group
Public Input No. 1294-NFPA 70-2017 [Section No. 706.7(D)]	PI from Fault Current Working Group
Public Input No. 1295-NFPA 70-2017 [Section No. 712.65]	PI from Fault Current Working Group
Public Input No. 1296-NFPA 70-2017 [Section No. 712.72]	PI from Fault Current Working Group
Public Input No. 1297-NFPA 70-2017 [Definition: Feeder Neutral Conductor]	PI from Fault Current Working Group

Submitter Information Verification

Submitter Full Name: Vincent Saporita
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Submittal Date: Mon Jul 24 11:04:10 EDT 2017

Public Input No. 1622-NFPA 70-2017 [Section No. 110.24(A)]

(A) Field Marking.

Service equipment at other than dwelling units shall be legibly marked in the field with the maximum 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: Electric utilities typically provide published maximum values of available short circuit current for use in determine minimum short circuit current ratings of service equipment.

Informational Note No.2: The available fault-current marking(s) addressed in 110.24 is related to required short-circuit current ratings of equipment. *NFPA 70E*-2015, *Standard for Electrical Safety in the Workplace,* provides assistance in determining the severity of potential exposure, planning safe work practices, and selecting personal protective equipment.

Statement of Problem and Substantiation for Public Input

The new informational note provides clarification about the responsibilities of public electric utilities to provide essential data for designing premises wiring systems and specifying equipment for use in such systems. It has been stated by some that electric utilities will not provide such information in the jurisdictions they serve. The new informational note should provide needed clarification about what information is required to be provided for authorities having jurisdiction, designers and engineering companies, electrical contractors and others that need the information essential for the project. Published maximum available fault current values are typically provided on the Internet by serving utilities. Many utilities also offer specific calculated values when requested, depending on the utility.

Submitter Information Verification

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Submittal Date: Wed Aug 02 13:11:40 EDT 2017

Public Input No. 1818-NFPA 70-2017 [Section No. 110.24(A)]

~~**(A)** Field Marking.~~

~~Service equipment at other than dwelling units shall be legibly marked in the field with the maximum 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: The available fault-current marking(s) addressed in 110.24 is related to required short-circuit current ratings of equipment. *NFPA 70E* -2015, *Standard for Electrical Safety in the Workplace,* provides assistance in determining the severity of potential exposure, planning safe work practices, and selecting personal protective equipment.~~

Statement of Problem and Substantiation for Public Input

Content now covered by 110.16(B). Possible conflict could occur regrading "available fault current" as stated in 110.16(B) and "maximum available fault current as stated in this section. Available fault is needed for accurate arc flash calculations. Maximum available fault current could refer to
1. Available fault current as calculated by the utility
2. Available fault current from utility plus motor contribution
3. Infinite bus calculation using transformer's impedance and full-load current
4. Infinite bus calculation plus motor contribution

Retaining this section could require inclusion of two fault currents on the service equipment.

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Submittal Date: Mon Aug 07 06:19:16 EDT 2017

Public Input No. 1927-NFPA 70-2017 [Section No. 110.24(A)]

(A) Field Marking.

Service equipment ~~at other than dwelling units~~ shall be legibly marked in the field with the maximum 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: The available fault-current marking(s) addressed in 110.24 is related to required short-circuit current ratings of equipment. *NFPA 70E*-2015, *Standard for Electrical Safety in the Workplace,* provides assistance in determining the severity of potential exposure, planning safe work practices, and selecting personal protective equipment.

Statement of Problem and Substantiation for Public Input

Dwelling units need to be included for this requirement. There are services installed on a daily bases with the available fault current over 10,000 A. The marking is necessary to inform installers changing out breakers. This marking will help to insure that replacement breakers are installed meeting the maximum available fault-current. Otherwise, the standard 10k breaker, that is more
readily available, will be installed replacing the higher rated breaker, creating a safety hazard.

Submitter Information Verification

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Submittal Date: Tue Aug 08 15:33:02 EDT 2017

Public Input No. 3707-NFPA 70-2017 [Section No. 110.24(A)]

(A) Field Marking.

Service equipment ~~at other than dwelling units~~ shall be legibly marked in the field with the maximum 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: The available fault-current marking(s) addressed in 110.24 is related to required short-circuit current ratings of equipment. *NFPA 70E*-2015, *Standard for Electrical Safety in the Workplace,* provides assistance in determining the severity of potential exposure, planning safe work practices, and selecting personal protective equipment.

Statement of Problem and Substantiation for Public Input

Dwelling units need to be included for this requirement. There are residential services installed on a daily bases where the available fault current is over 10k amps. Installing main breakers rated lower than the maximum available fault current is a safety issue for residential as well as commercial.

Submitter Information Verification

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Submittal Date: Wed Sep 06 17:48:11 EDT 2017

Public Input No. 4105-NFPA 70-2017 [Section No. 110.24(A)]

(A) Field Marking.

Service equipment at other than ~~dwelling~~ single-family and two family dwelling units shall be legibly marked in the field with the maximum 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: The available fault-current marking(s) addressed in 110.24 is related to required short-circuit current ratings of equipment. *NFPA 70E*-2015, *Standard for Electrical Safety in the Workplace,* provides assistance in determining the severity of potential exposure, planning safe work practices, and selecting personal protective equipment.

Statement of Problem and Substantiation for Public Input

At multifamily units you usually have 600 to 1200 amp services with meter packs or more. The utility transformer is usually brought on site next to service location, i don't know why we are not marking these applications when the commercial building next door with a 200 ampere service requires marking??

Submitter Information Verification

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Submittal Date: Thu Sep 07 14:17:09 EDT 2017

Public Input No. 645-NFPA 70-2017 [Section No. 110.24(A)]

(A) Field Marking.

Service equipment at other than dwelling units shall be legibly marked in the field with the maximum 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 prepared by a qualified person, documented, and made available to those authorized to design, install, inspect, maintain, or operate the system.

Informational Note: The available fault-current marking(s) addressed in 110.24 is related to required short-circuit current ratings of equipment. *NFPA 70E* -2015, *Standard for Electrical Safety in the Workplace,* provides assistance in determining the severity of potential exposure, planning safe work practices, and selecting personal protective equipment.

Statement of Problem and Substantiation for Public Input

The labeling in this section is a very serious code requirement and it should be clear in the code language that the label should not be crafted by an owner (layperson) or anyone other than a qualified person. Electrical inspectors do have issues with owners trying to do their own work, and this change would provide leverage to the electrical inspector so he can require that the individual who crafts the label be qualified in some manner.

Submitter Information Verification

Submitter Full Name: Nick Sasso
Organization: State of Wyoming
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Submittal Date: Wed May 03 22:42:58 EDT 2017

Public Input No. 1250-NFPA 70-2017 [Section No. 110.24(B)]

(B) Modifications.

When modifications to the electrical installation occur that affect the ~~maximum~~ available fault current at the service, the ~~maximum~~ available fault current shall be verified or recalculated as necessary to ensure the service equipment ratings are sufficient for the ~~maximum~~ available fault current at the line terminals of the equipment. The required field marking(s) in 110.24(A) shall be adjusted to reflect the new level of ~~maximum~~ available fault current.

Exception: The field marking requirements in 110.24(A) and 110.24(B) shall not be required in industrial installations where conditions of maintenance and supervision ensure that only qualified persons service the equipment.

Statement of Problem and Substantiation for Public Input

The Fault Current Working Group was formed to support the Correlating Committee's Usability Task Group. Members of the Fault Current Working Group included Scott Blizard, Jim Dollard, Carl Fredericks, Jeff Hidaka, Chris Jensen, Alan Manche, and Vince Saporita. The goal of the Fault Current Working Group was to analyze the usage of the terms "short-circuit" and "fault" throughout the NEC, and submit Public Inputs, as appropriate, to improve clarity, consistency, and usability.

While "short-circuit" and "fault" have been used interchangeably throughout the NEC (and the whole electrical industry), there are subtle differences between the two. This has resulted in confusion and a lack of consistency. Thus, numerous related Public Inputs have been submitted by the Working Group.

The definition of "Fault Current, Available (Available Fault Current)" is taken from SR8 of NFPA70E-2018. The definition ("The largest amount of current capable of being delivered at a point on the system during a short-circuit condition") clarifies that "available fault current" is the highest short-circuit current that can flow at a particular point in the electrical system. The Informational Note, also taken from SR8 of NFPA70E-2018, ("A short-circuit can occur during abnormal conditions such as a fault between circuit conductors or a ground fault. See Figure 100.0") provides an example of the relationship between "short-circuit" and "fault". Figure 100.0, also from SR8 of NFPA70E-2018, helps explain the difference between "available fault current", "short-circuit current rating", and "interrupting rating".

"Available short-circuit current" and "short-circuit current" are changed to "available fault current" for improved consistency.

"Maximum" is deleted in front of "maximum available fault current" (and "maximum available short-circuit current") because the new definition of "available fault current" clearly includes the maximum (largest). The only exceptions, which remain unchanged, are in 250.4(A)(5) and 250.4(B)(3), where the word "maximum" is still appropriate and is necessary for a complete understanding of the requirement.

Equipment and component fault current ratings, short-circuit ratings, and short-circuit withstand ratings are changed to "short-circuit current ratings", in agreement with equipment and component listing standards. The only exceptions, which remain unchanged, are for switch "fault closing ratings", also to be in agreement with existing equipment and component listing standards.

Finally, "Short-circuit current calculation" is replaced with "available fault current calculation", improving consistency.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 1246-NFPA 70-2017 [Definition: Coordination, Selective (Selective Coordination...]	PI from the Fault Current Working Group
Public Input No. 1247-NFPA 70-2017 [New Definition after Definition: Externally Operable.]	PI from the Fault Current Working Group
Public Input No. 1248-NFPA 70-2017 [New Definition after Definition: Externally Operable.]	PI from the Fault Current Working Group
Public Input No. 1249-NFPA 70-2017 [Section No. 110.24(A)]	PI from the Fault Current Working Group
Public Input No. 1251-NFPA 70-2017 [Section No. 225.52(B)]	PI from the Fault Current Working Group

Public Input No. 1252-NFPA 70-2017 [Section No. 230.82]	PI from the Fault Current Working Group
Public Input No. 1253-NFPA 70-2017 [Section No. 230.205(B)]	PI from the Fault Current Working Group
Public Input No. 1254-NFPA 70-2017 [Section No. 368.258]	PI from the Fault Current Working Group
Public Input No. 1255-NFPA 70-2017 [Section No. 430.99]	PI from the Fault Current Working Group
Public Input No. 1256-NFPA 70-2017 [Section No. 445.11]	PI from the Fault Current Working Group
Public Input No. 1257-NFPA 70-2017 [Section No. 480.7(D)]	PI from the Fault Current Working Group
Public Input No. 1258-NFPA 70-2017 [Section No. 490.21(A)(4)]	PI from the Fault Current Working Group
Public Input No. 1259-NFPA 70-2017 [Section No. 490.21(B)(2)]	PI from the Fault Current Working Group
Public Input No. 1260-NFPA 70-2017 [Section No. 490.21(C)(3)]	PI from the Fault Current Working Group
Public Input No. 1263-NFPA 70-2017 [Section No. 490.21(D)(2)]	PI from the Fault Current Working Group
Public Input No. 1264-NFPA 70-2017 [Section No. 490.21(D)(4)]	PI from the Fault Current Working Group
Public Input No. 1265-NFPA 70-2017 [Section No. 490.21(E) [Excluding any Sub-Sections]]	PI from the Fault Current Working Group
Public Input No. 1266-NFPA 70-2017 [Section No. 440.10(B)]	PI from the Fault Current Working Group
Public Input No. 1267-NFPA 70-2017 [Section No. 505.7(F)]	PI from the Fault Current Working Group
Public Input No. 1271-NFPA 70-2017 [Section No. 545.13]	PI from the Fault Current Working Group
Public Input No. 1272-NFPA 70-2017 [Section No. 550.15(K)]	PI from the Fault Current Working Group
Public Input No. 1273-NFPA 70-2017 [Section No. 551.47(O)]	PI from the Fault Current Working Group
Public Input No. 1274-NFPA 70-2017 [Section No. 552.48(N)]	PI from the Fault Current Working Group
Public Input No. 1275-NFPA 70-2017 [Section No. 620.16(B)]	PI from the Fault Current Working Group
Public Input No. 1276-NFPA 70-2017 [Section No. 620.51(D)(2)]	PI from the Fault Current Working Group
Public Input No. 1277-NFPA 70-2017 [Sections 670.5(1), 670.5(2)]	PI from the Fault Current Working Group
Public Input No. 1281-NFPA 70-2017 [Section No. 690.8(A)(1)]	PI from the Fault Current Working Group
Public Input No. 1282-NFPA 70-2017 [Section No. 690.8(D)]	PI from the Fault Current Working Group
Public Input No. 1283-NFPA 70-2017 [Section No. 690.9(A)]	PI from the Fault Current Working Group
Public Input No. 1284-NFPA 70-2017 [Section No. 690.13(E)]	PI from the Fault Current Working Group
Public Input No. 1285-NFPA 70-2017 [Section No. 690.15(B)]	PI from the Fault Current Working Group

Public Input No. 1286-NFPA 70-2017 [Section No. 690.32]	PI from the Fault Current Working Group
Public Input No. 1287-NFPA 70-2017 [Section No. 695.6(I)]	PI from the Fault Current Working Group
Public Input No. 1288-NFPA 70-2017 [Section No. 700.4(A)]	PI from the Fault Current Working Group
Public Input No. 1289-NFPA 70-2017 [Section No. 701.4]	PI from the Fault Current Working Group
Public Input No. 1290-NFPA 70-2017 [Section No. 702.4(A)]	PI from the Fault Current Working Group
Public Input No. 1291-NFPA 70-2017 [Section No. 705.22]	PI from the Fault Current Working Group
Public Input No. 1292-NFPA 70-2017 [Section No. 705.31]	PI from the Fault Current Working Group
Public Input No. 1293-NFPA 70-2017 [Section No. 705.65(A)]	PI from the Fault Current Working Group
Public Input No. 1294-NFPA 70-2017 [Section No. 706.7(D)]	PI from the Fault Current Working Group
Public Input No. 1295-NFPA 70-2017 [Section No. 712.65]	PI from the Fault Current Working Group
Public Input No. 1296-NFPA 70-2017 [Section No. 712.72]	PI from the Fault Current Working Group
Public Input No. 1297-NFPA 70-2017 [Definition: Feeder Neutral Conductor]	PI from the Fault Current Working Group

Submitter Information Verification

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Submittal Date: Mon Jul 24 11:08:49 EDT 2017

Public Input No. 1819-NFPA 70-2017 [Section No. 110.24(B)]

~~**(B)** Modifications.~~

~~When modifications to the electrical installation occur that affect the maximum available fault current at the service, the maximum available fault current shall be verified or recalculated as necessary to ensure the service equipment ratings are sufficient for the maximum available fault current at the line terminals of the equipment. The required field marking(s) in 110.24(A) shall be adjusted to reflect the new level of maximum available fault current.~~

~~*Exception: The field marking requirements in 110.24(A) and 110.24(B) shall not be required in industrial installations where conditions of maintenance and supervision ensure that only qualified persons service the equipment.*~~

Statement of Problem and Substantiation for Public Input

Move and modify to become 110.16(C). Reference Public Input No. 1820-NFPA 70-2017.

Submitter Information Verification

Submitter Full Name: David Bredhold
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Affilliation: Employee
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Submittal Date: Mon Aug 07 06:27:27 EDT 2017

Public Input No. 1871-NFPA 70-2017 [Section No. 110.25]

110.25 Lockable Disconnecting Means.

~~If a~~ All 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 No. 1 : Locking provisions for a cord-and-plug connection shall not be required to remain in place without the lock installed.

Exception No. 2: Unit switches as permitted by 422.34 and 424.19(C) shall not be required to be lockable.

Statement of Problem and Substantiation for Public Input

Typically the current code requires lockable disconnects only when the disconnect is not within sight of the equipment. This doesn't make sense with lockout/tagout procedures as stated in NFPA 70E. Lockout procedures do not specify where the disconnect is located and in most safety videos the disconnect being locked out is at the equipment. Also, there is no safety procedure that requires someone to watch the "within sight" disconnecting means to make sure someone doesn't turn it on. It is unreasonable to think a person working on the equipment will be keeping an eye on a disconnect that may be 50 feet away. The added exception addresses unit switches on appliances and heaters which are built into the appliance or heater and the person servicing the equipment has control of the unit switch.

Submitter Information Verification

Submitter Full Name: David Hittinger
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Affilliation: Independent Electrical Contractors Codes and Standard
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Submittal Date: Mon Aug 07 16:18:19 EDT 2017

Public Input No. 2940-NFPA 70-2017 [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.

Additional Proposed Changes

File Name	Description	Approved
PV_Industry_Forum.pdf		✓

Statement of Problem and Substantiation for Public Input

Repetitive language deleted without changing intent or meaning.

This PI was developed by the PV Industry Forum (PVIF).

Submitter Information Verification

Submitter Full Name: Philip Undercuffler
Organization: OutBack Power Technologies
Affilliation: PV Industry Forum
Street Address:
City:
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Submittal Date: Tue Aug 29 12:45:37 EDT 2017

The **PV Industry Forum (PVIF)** is a collaborative initiative of several organizations dedicated to continually improving the installation safety of PV systems in the U.S. The organizations are the Interstate Renewable Energy Council (IREC), the Large-Scale Solar Association (LSA), the PV Industry Codes Council (PVICC), the Solar Energy Industry Association (SEIA) and Solar Energy International (SEI). This coalition has come together to organize, convene, support and mentor solar industry professionals through the NEC public input process, which is open to all solar industry participants.

This collaborative effort has resulted in the consensus development of numerous solar-related Public Input proposals for consideration. The list of task group members indicates those individuals who have contributed to the development of various Public Inputs in nine different tasks groups. A consensus process was used to develop each Public Input, therefore this list does not necessarily indicate that each individual or their representative organization participated in or has agreed with every proposed Public Input submitted under the PVIF effort. Each participant has agreed that any original proposal that they submitted and which was subsequently improved by our process is assigned as original and / or improved work to PVIF for submittal and release to NFPA as a proposed Public Input.

Members of the PVIF's effort include:

Coordinating committee:
Bill Brooks, Brooks Solar and PVICC
Evelyn Butler and Joe Cain, Solar Energy Industry Association
Jason Fisher, Tesla / SEIA (Vice Chair, Codes & Standards Working Group)
Rebekah Hren and Brian Mehalic, Solar Energy International
Lee Kraemer, First Solar / Large-Scale Solar Association
Larry Sherwood, Interstate Renewable Energy Council

Conveners:
Mark Baldassari, Enphase Energy
Ward Bower, Ward Bower Innovations
Bill Brooks, PVICC
Dave Click, ESA Renewables
Adam Cordova,
Chris Deline, NREL
Jason Fisher, Tesla
Rebekah Hren, SEI
Brian Lydic, IREC
Lee Kraemer, First Solar
Ryan Mayfield, Renewable Associates
Brian Mehalic , SEI
Isaac Opalinsky, SunPower
Charles Picard, Tesla
Larry Sherwood, IREC
Philip Undercuffler, OutBack Power
Dave White,
Robert Wills, InterGrid

Task Group Members (alphabetical last name):

Hasib Amin, SunPower
Mark Baldassari, Enphase Energy
Greg Ball, Tesla
John Berdner, HiQ Solar
Jason Bobruk, SolarEdge
Kyle Bolger, Blue Planet Energy
Ward Bower, Ward Bower Innovations & SEIA
Jeanette Brasher, Unirac
Bill Brooks, Brooks Solar & PVICC
Logan Boutilier, DNV GL
Evelyn Butler, SEIA
Joe Cain, SEIA
Brandon Carlson, New Day Solar
Sudipta Chakraborty, NREL
Dave Click, ESA Renewables
Tim Coats, SunPower
Michael Coddington, NREL
Kate Collardson, Certain Teed/St. Gobain
David Conover, PNNL
Adam Cordova
James Cormican, RBI Solar
Chris Crane, Sunrun
Marv Dargatz, Kaylaco Enterprises
Charlie Dearie, McCalmont Engineering
Chris Deline, NREL
Jeff Fecteau, UL
Randy Fish
Jason Fisher, Tesla & SEIA
Chris Fox, SunPower
Christopher Freitas, Redback Technologies
Todd Fries, Hellerman Tyton
Ajay Friesen, SunPower
Matt Germain, Ampt
Marina Golden, SunPower
Philippe Gregoire, Canadian Solar
Jeni Hall, Oregon Energy Trust
Marvin Hamon, Hamon Engineering
Sarah Harrington, Sunrun
Daniel Harsadi, Baywa R.E.
Bryan Holland, NEMA
John Holmes, UCSD
Rebekah Hren, SEI
Raymond Hudson, DNV GL
Stoli Jäger, Bentek
Sagar Khare, Maxim Integrated
Nick Korth, Hellerman Tyton
Lee Kraemer, First Solar & LSA
Chuck Ladd, BV
Olga Lavrova, Sandia Labs
Brian Lydic, IREC
Jacob Marshall, SunPower
Evan Martin, Burndy
Ryan Mayfield, Renewable Associates
Brian Mehalic, SEI
Tom McCalmont, McCalmont Engineering
Klaus Nicolaedis, Unirac
Isaac Opalinsky, SunPower
Matt Paiss, IAFF
Leo Patnode, Enphase Energy
Ted Petsas, SunPower
Charles Picard, Tesla
Loren Powers, DNV GL
Sumitha Raj, Daimler
Blair Reynolds, Enphase Energy
Paul Robusto, MiaSole
Mark Rodriguez, Sunrun
Miles Russell, Solectria
Alkesh Shah, First Solar
Jon Sharp, Schneider Electric Solar
Devan Shea, Burndy
Larry Sherwood, IREC
Bijay Shrestha, Tigo Energy
Chris Sommerfeld, Sunrun
Ryan Stankevitz, Sensata
Tim Stocker, SMA
Gerry Tortorice, Sunstreet Energy
Philip Undercuffler, OutBack Power
Laura Walters, SEI
Thomas Wegener, SMA
Carol Weis, Sun Energy Power
Dave White, Bentek
Will White, SEI
Sean White, Sean White
John Wiles, John Wiles
Rob Wills, Intergrid
Benjamin Wong, SunPower
Steve Wozniak, First Solar
Tim Zgonena, UL

Public Input No. 2662-NFPA 70-2017 [Section No. 110.26]

110.26 Spaces About Electrical Equipment.

Access and working space shall be provided and maintained about all electrical equipment to permit ready and safe operation and maintenance of such equipment.

(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: NFPA 70E-2015, *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. In planning safe work practices, an electrically safe work condition should be established prior to working on electrical equipment. Requirements in this *Code* do not endorse working on energized electrical 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, 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.

(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.

(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 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.

Exception No. 1: In existing dwelling units, service equipment or 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. 2: 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.

Exception No. 3: On battery systems mounted on open racks, the top clearance shall comply with 480.10(D).

(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:

(a) 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.).

(b) 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.

(c) All enclosure doors or hinged panels shall be capable of opening a minimum of 90 degrees.

(d) The space in front of the enclosure shall comply with the depth requirements of Table 110.26(A)(1). 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.

(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.

(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.

(C) Entrance to and Egress from Working Space.

(1) Minimum Required.

At least one entrance of sufficient area shall be provided to give access to and egress from working space about electrical equipment.

(2) Large Equipment.

For equipment rated 1200 amperes or more and over 1.8 m (6 ft) wide that contains overcurrent devices, switching devices, or control devices, there shall be one entrance to and egress from the required working space not less than 610 mm (24 in.) wide and 2.0 m (6½ ft) high at each end of the working space.

A single entrance to and egress from the required working space shall be permitted where either of the conditions in 110.26(C)(2)(a) or (C)(2)(b) is met.

(a) *Unobstructed Egress.* Where the location permits a continuous and unobstructed way of egress travel, a single entrance to the working space shall be permitted.

(b) *Extra Working Space.* Where the depth of the working space is twice that required by 110.26(A)(1), a single entrance shall be permitted. It shall be located such that the distance from the equipment to the nearest edge of the entrance is not less than the minimum clear distance specified in Table 110.26(A)(1) for equipment operating at that voltage and in that condition.

(3) Personnel Doors.

Where equipment rated 800 A or more that contains overcurrent devices, switching devices, or control devices is installed and there is a personnel door(s) intended for entrance to and egress from the working space less than 7.6 m (25 ft) from the nearest edge of the working space, the door(s) shall open in the direction of egress and be equipped with listed panic hardware.

(D) Illumination.

Illumination shall be provided for all working spaces about service equipment, switchboards, switchgear, panelboards, or motor control centers installed indoors. Control by automatic means only shall not be permitted. 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.

(E) Dedicated Equipment Space.

All 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.

(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 (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.

Exception: Structural overhangs or roof extensions shall be permitted 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.

(F) Locked Electrical Equipment Rooms or Enclosures.

Electrical equipment rooms or enclosures housing electrical apparatus that are controlled by a lock(s) shall be considered accessible to qualified persons.

Statement of Problem and Substantiation for Public Input

This is a companion PI to the PI on 408.3(D) AND 408.18(B). In multiple places in the Code, requirements include provisions to protect the electrician from "inadvertent contact" with energized parts (reference 404.6(C), 408.3(A), 408.3(D) as examples). The inclusions of such barriers or designs should not be considered as endorsing working on energized equipment. The explanation of the Informational Note specifies that requirements in the Code do not endorse working on energized equipment.

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Public Input No. 2519-NFPA 70-2017 [Section No. 110.26(A)]

(A) Working Space.

Working space for equipment operating ~~at~~ from 50 to 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: NFPA 70E-2015, *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.

(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~~ 50–150	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, 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.

(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.

(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 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.

Exception No. 1: In existing dwelling units, service equipment or 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. 2: 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.

Exception No. 3: On battery systems mounted on open racks, the top clearance shall comply with 480.10(D).

(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:

(a) 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.).

(b) 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.

(c) All enclosure doors or hinged panels shall be capable of opening a minimum of 90 degrees.

(d) The space in front of the enclosure shall comply with the depth requirements of Table 110.26(A)(1). 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.

(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.

Statement of Problem and Substantiation for Public Input

As currently written, the working space requirements apply to all voltages, even 5 volts dc. Both NFPA 70E and OSHA regard voltages below 50 volts as non-hazardous. This change brings the NEC into alignment with both 70E and OSHA. The limits for above ceiling and crawl spaces were left at 0-1000. The Code panel can consider changing these as well.

If the change from 0 - 150 to 50 - 150 is accepted, there is no longer a need for the special permission section

There is another Public Input that leaves the voltage range the same, but makes an exception for Class II circuits.

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Public Input No. 2520-NFPA 70-2017 [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*. The requirements of this section shall not apply to Class II circuits.

Informational Note: NFPA 70E-2015, *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.

(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, 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.

(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.

(a) *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.

(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 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.

(a) *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.

Exception No. 1: In existing dwelling units, service equipment or 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. 2: 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.

Exception No. 3: On battery systems mounted on open racks, the top clearance shall comply with 480.10(D).

(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:

(a) 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.).

(b) 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.

(c) All enclosure doors or hinged panels shall be capable of opening a minimum of 90 degrees.

(d) The space in front of the enclosure shall comply with the depth requirements of Table 110.26(A)(1). 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.

(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.

Statement of Problem and Substantiation for Public Input

PI 2519 recommends changing the working space requirements to only apply over 50 volts. If PI 2519 is not acceptable to the Code panel, this PI recommends keeping the voltage levels the same but making an exception for Class II circuits. If the purpose of the 110.26 working space is to protect the worker from shock, it should not apply to Class II circuits which are incapable of shocking the worker.

Also, the special permission that allows the AHJ to reduce working spaces for low voltage is only in the Depth section. This special permission should also apply to Width and Height.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2519-NFPA 70-2017 [Section No. 110.26(A)]	what should the lower voltage limit be before working spaces are invoked

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Public Input No. 1623-NFPA 70-2017 [Section No. 110.26(A) [Excluding any Sub-Sections]]

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 No. 1 : NFPA 70E-2015, *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. 2: Examples of equipment that is not likely to require examination, adjustment, servicing, or maintenance while energized include, but are not limited to transformers, capacitors, and motors.

Statement of Problem and Substantiation for Public Input

Confusion exists when applying the working space rules in this section. Equipment such as transformers, motors, and capacitors are examples of equipment that is not likely to require service operations while energized. In addition applying this rule to transformers can create inconsistencies with what is required for like equipment. For example, not all transformers are created equal. It does not make sense to require 110.26(A) working space for a 75 KVA dry-type transformer installed in an electrical room, while no working space is required for a door bell or other small transformer such as a wall-hung transformer that has an integral junction box and is connected through pigtail leads. These types of equipment have installation instructions that drive certain installation requirements such as for ventilation and general accessibility. The proposed revision is an attempt to assist installers and inspectors in promotion of more consistent application of these working space rules.

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Public Input No. 3751-NFPA 70-2017 [Section No. 110.26(A) [Excluding any Sub-Sections]]

Working space for equipment operating at 1000 volts, nominal, or less to ground and likely to require examination, adjustment, servicing, or maintenance ~~while~~ with exposed energized parts present, 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: NFPA 70E-2015, *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.

Statement of Problem and Substantiation for Public Input

This PI is to bring the NEC and NFPA 70E into alignment. It is 'exposed energized' that creates the restricted and limited approach boundaries. Something can be 'energized' and represent no hazard to the worker. It is 'exposed energized' that represents the hazard.

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Public Input No. 1669-NFPA 70-2017 [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.

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.

Informational Note: See Article 100 for the definition of voltage-to-ground for ground, ungrounded and reference grounded systems.

(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, 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 Input

There is some confusion on how to apply Table 110.26 for ungrounded systems, and especially for reference grounded PV systems. The Informational Note reminds the user to see Article 100 on the definition of voltage-to-ground, which has a PI for clarity.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 1665-NFPA 70-2017 [Definition: Voltage to Ground.]	

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 03 13:16:00 EDT 2017

Public Input No. 2450-NFPA 70-2017 [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.

Housekeeping pads that elevate electrical equipment above the floor or working platform shall not protrude more than 100 mm (4 inches) into the depth of workspace required in front of electrical equipment.

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, 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 Input

Concrete 'housekeeping pads' are used to elevate electrical equipment above the floor in commercial and industrial occupancies, to protect electrical equipment from flooding from a broken water or sprinkler pipe, etc..
It is not uncommon to find housekeeping pads that protrude out into the 110.26(A) required depth of workspace, creating a tripping hazard for electrical workers when working in energized electrical equipment. I have seen this multiple times in my career. This uneven work platform is a safety hazard for electricians. When working in equipment, the change in elevation can cause them to stumble into live parts. The idea is very similar to the restriction submitted by my friend Keith Lofland of IAEI in 2008 NEC Section 240.24(F), that prohibits overcurrent devices from being installed over the steps of a stairway.
It is important to note that the limitation of protrusion of a maximum of 150 mm (6 in.) is specifically limited to equipment, not to a concrete housekeeping pad. A concrete housekeeping pad does not meet the NEC definition of equipment. Why did I propose 4 inches? Because electrical workers come in all shapes and sizes, and to perform some work inside equipment requires the worker to be in close proximity. Housekeeping pads that have been 3-4

inches max. out into the workspace is what I've always specified and / or installed for MCC's and Switchboards / Switchgear, and has proven to work well.

This simple new requirement will improve safety and provide clarity for what is permitted, and will be clear and straightforward for installers to understand, and inspection personnel to enforce.

Normally 3.5 inches - the width of a 2 x 4 wood stud, when laid on its side, seems to work best for the maximum height of a housekeeping pad, and not a 2 x 6 or 2 x 8. But I don't believe that a height of the housekeeping pad should be addressed here, and I'm not proposing that. I have seen where a housekeeping pad has been installed by non-electrical workers that is higher than it should be - such as over seven inches tall, and when the switchgear or motor control center was installed, caused the maximum permitted height for a switch in the equipment to be exceeded. However, we already have clear NEC text in 404.8(A) and 240.24(A) to address those basic safety violations.

Submitter Information Verification

Submitter Full Name: Michael Weitzel
Organization:
Street Address:
City:
State:
Zip:
Submittal Date: Fri Aug 18 12:32:15 EDT 2017

Public Input No. 39-NFPA 70-2017 [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~~ 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~~ If condition 3 cannot be achieved in an existing building where electrical equipment is being replaced, Condition 2 working clearance shall be permitted between dead-front switchboards, switchgear, 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 Input

this section should not be permitted when adequate space is available in front of the equipment. the new text makes it clear that the compliant installation does not require a reduction in work space. The option should apply only if there is a need to reduce the space by six inched under the prescribed safety measures

Submitter Information Verification

Submitter Full Name: Alfio Torrisi

Organization: Master electrician

Street Address:

City:

State:

Zip:

Submittal Date: Tue Jan 24 11:59:48 EST 2017

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Public Input No. 419-NFPA 70-2017 [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.

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, 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 Input

Usability and layout of Table 110.26(A)(1) Working Spaces.
Here in TerraView Table 110.26(A)(1) is shown in the proper placement, but in the printed edition this Table (page 70-47) is placed after Section 110.26(A)(4). Actually it is placed inside the text of this section.
This is or can be confusing to users of the NEC. When instructing on code arrangement and layout this becomes an issue especially to new users of the code. If this was done at the printing stage in the development process it needs to be addressed by a Production Manager or team to exam typesetting, page layout, and proofreading to ensure the quality and accuracy in the finished printed product.
This problem is a common theme throughout the printed version of the code book and needs to be addressed by each panel or a task group assigned to look at this problem.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 418-NFPA 70-2017 [Section No. 90.3]	Layout/usability

Submitter Information Verification

Submitter Full Name: Darryl Hill
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State:
Zip:
Submittal Date: Wed Mar 29 17:31:09 EDT 2017

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Public Input No. 1383-NFPA 70-2017 [Section No. 110.26(A)(3)]

(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 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.

Exception No. 1: In existing dwelling units, service equipment or 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. 2: 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.

Exception No. 3: On battery systems mounted on open racks, the top clearance shall comply with 480.10(D).

Exception No. 4 Housekeeping pads extending not more than 150 mm (6 in.) beyond the front of the electrical equipment shall be permitted.

Statement of Problem and Substantiation for Public Input

The installation of housekeeping pads under electrical equipment is a common commercial and industrial practice. It does not appear that the current wording of 110.26(A)(3) actually permits such installations. I think it would be a stretch to see the housekeeping pad as equipment based on the Article 100 definition.

Submitter Information Verification

Submitter Full Name: Don Ganiere
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jul 27 15:13:11 EDT 2017

Public Input No. 2202-NFPA 70-2017 [Section No. 110.26(A)(3)]

(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 that is associated with the electrical installation ~~and~~ including concrete house keeping pads to support electrical equipment, 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.

Exception No. 1: In existing dwelling units, service equipment or 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. 2: 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.

Exception No. 3: On battery systems mounted on open racks, the top clearance shall comply with 480.10(D).

Statement of Problem and Substantiation for Public Input

Concrete house keeping pads that support electrical switchgear in electrical rooms or even outside of the building that is not extended out more than 6 inches from the front of the electrical equipment should not be in violation of 110.26 Some electrical inspectors think that this pad is not associated with the electrical equipment as described in 110.26(A)(3).
This new change would clear up the confusion in electrical rooms.

Submitter Information Verification

Submitter Full Name: John Plourde
Organization: NH SCHOOL OF MECANICAL TRADES
Affilliation: CLASS OF 2018
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 15 09:18:42 EDT 2017

Public Input No. 3237-NFPA 70-2017 [Section No. 110.26(A)(3)]

(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~~ 0 m (6 ~~1~~/~~2~~ ft 7 in.) ~~or~~ or the height of the equipment, whichever is greater. 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.

Exception No. 1: In existing dwelling units, service equipment or 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. 2: 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.

Exception No. 3: On battery systems mounted on open racks, the top clearance shall comply with 480.10(D).

Statement of Problem and Substantiation for Public Input

Electrical workers are taller these days.
This provision improves worker safety for those working on or around electrical equipment.
A qualified electrical worker that stands 6 ft. 3 inches tall, without his required PPE hard hat and arc-rated face shield on, will be very close to 6'7" tall. It is not uncommon at all to have electrical workers who stand 6' 3" or taller, with required protective footwear, PPE hard hat, or arc-rated face shield.
I have had apprentices who stood 6 ft. 6 inches high, without their required PPE hard hat on.
This also improves better accuracy and consistency in the Code, because 6 ft. 7 in. is closer to 2.0 meters than 6 ft. 6 in. is, and would affect only new installations.

Submitter Information Verification

Submitter Full Name: Michael Weitzel
Organization:
Street Address:
City:
State:
Zip:
Submittal Date: Mon Sep 04 13:59:02 EDT 2017

Public Input No. 1807-NFPA 70-2017 [Section No. 110.26(B)]

(B) Clear Spaces.

Working space required by this section shall not be used for storage and if located outdoors shall also be mantained clear from vegetation and weather events . 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.

Additional Proposed Changes

File Name	Description	Approved
IMG_0230.JPG	access to emergency controls	✓
IMG_0239.JPG	fused disconnect access	✓
IMG_0233.JPG	service disconnect buried in parking lot snow	✓
disco.JPG	vegetation	✓
disco1.JPG	disco with vines	✓

Statement of Problem and Substantiation for Public Input

Snow, fallen debris and vegetation inhibit the safe operation and maintenance of the equipment, notice is to maintain this area.

Submitter Information Verification

Submitter Full Name: Alfio Torrisi
Organization: Master electrician
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City:
State:
Zip:
Submittal Date: Sun Aug 06 09:48:14 EDT 2017


EMERGENCY


PARK &
RIDE

Public Input No. 1624-NFPA 70-2017 [Section No. 110.26(C)]

(C) Entrance to and Egress from Working Space.

(1) Minimum Required.

At least one entrance of sufficient area shall be provided to give access to and egress from working space about electrical equipment.

(2) Large Equipment.

For equipment rated 1200 amperes or more and over 1.8 m (6 ft) wide that contains overcurrent devices, switching devices, or control devices, there shall be one entrance to and egress from the required working space not less than 610 mm (24 in.) wide and 2.0 m (6½ ft) high at each end of the working space.

A single entrance to and egress from the required working space shall be permitted where either of the conditions in 110.26(C)(2)(a) or (C)(2)(b) is met.

(a) *Unobstructed Egress.* Where the location permits a continuous and unobstructed way of egress travel, a single entrance to the working space shall be permitted.

(b) *Extra Working Space.* Where the depth of the working space is twice that required by 110.26(A)(1), a single entrance shall be permitted. It shall be located such that the distance from the equipment to the nearest edge of the entrance is not less than the minimum clear distance specified in Table 110.26(A)(1) for equipment operating at that voltage and in that condition.

(3) Personnel Doors.

Where equipment rated 800 A or more that contains overcurrent devices, switching devices, or control devices is installed and there is a personnel door(s) intended for entrance to and egress from the working space less than 7.6 m (25 ft) from the nearest edge of the working space, the door(s) shall open in the direction of egress and be equipped with listed panic hardware.

(4) Entrance and Egress for Equipment with Doors. For equipment containing overcurrent devices, switching devices, or control devices and equipped with doors that open only 90 degrees, in addition to the minimum working spaces required in 110.26(A), there shall be a minimum clearance of 610 mm (24 in.) wide and 2.0 m (61 ? 2 ? ft) high beyond the end of the equipment door(s) when the door(s) are in the maximum open position. For equipment with doors that are not restricted to 90 degrees when in the open most position and the door(s) swing open to at least 120 degrees beyond the closed position, this requirement shall not apply.

Additional Proposed Changes

File Name	Description	Approved
110.26_C_4_Art_File.pdf		✓

Statement of Problem and Substantiation for Public Input

This situation is not addressed in the NEC yet is real and creates significant worker safety concerns of trapping a worker between open equipment doors and an obstruction such as a wall facing the equipment. See the sketch provided that illustrates the problem. For equipment with doors that can be opened more than 90 degrees but not less than 120 degrees from the closed position, this requirement would not apply. Some jurisdictions have a local amendment that address this issue.

Submitter Information Verification

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State:

Zip:

Submittal Date: Wed Aug 02 13:22:11 EDT 2017

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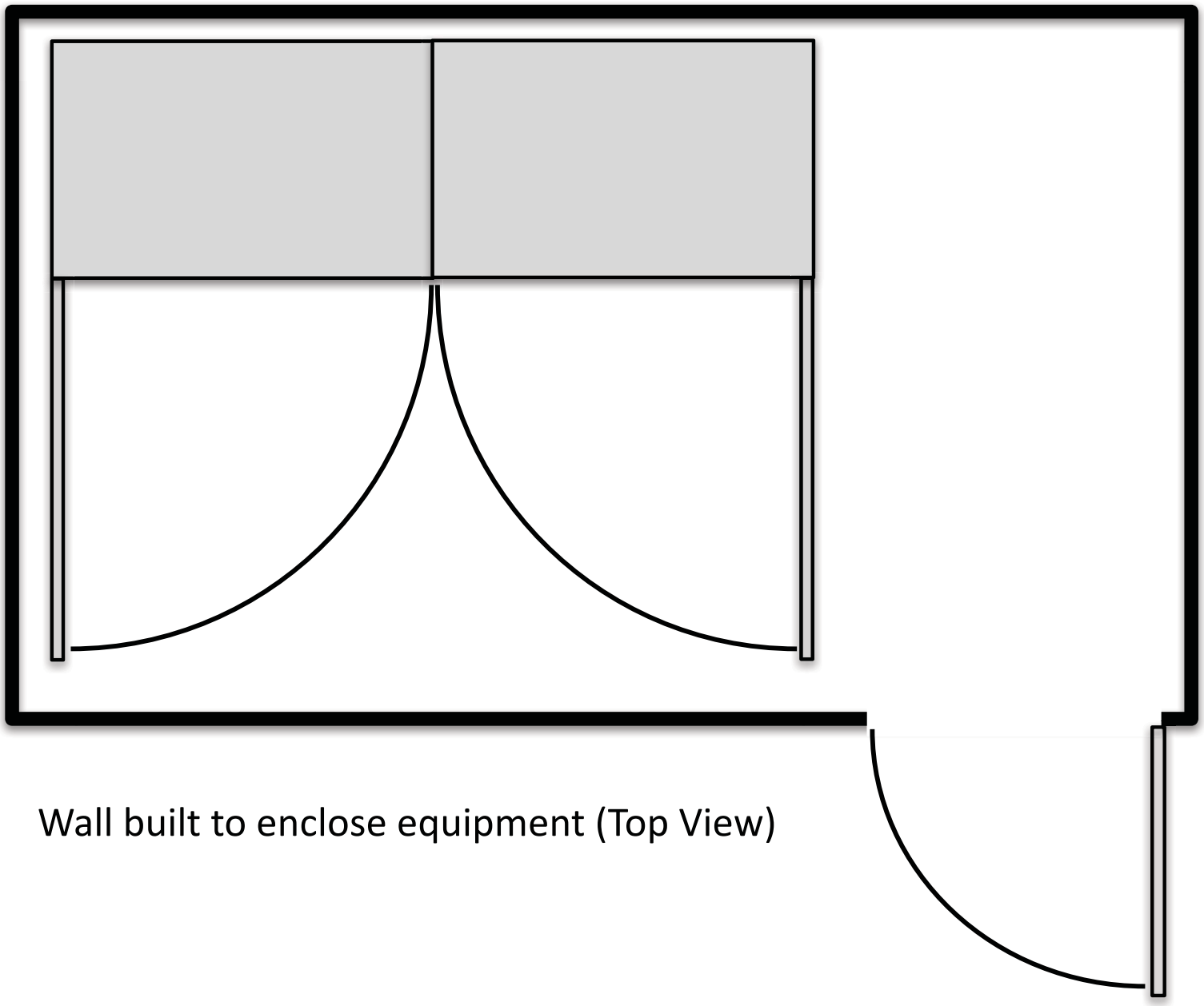
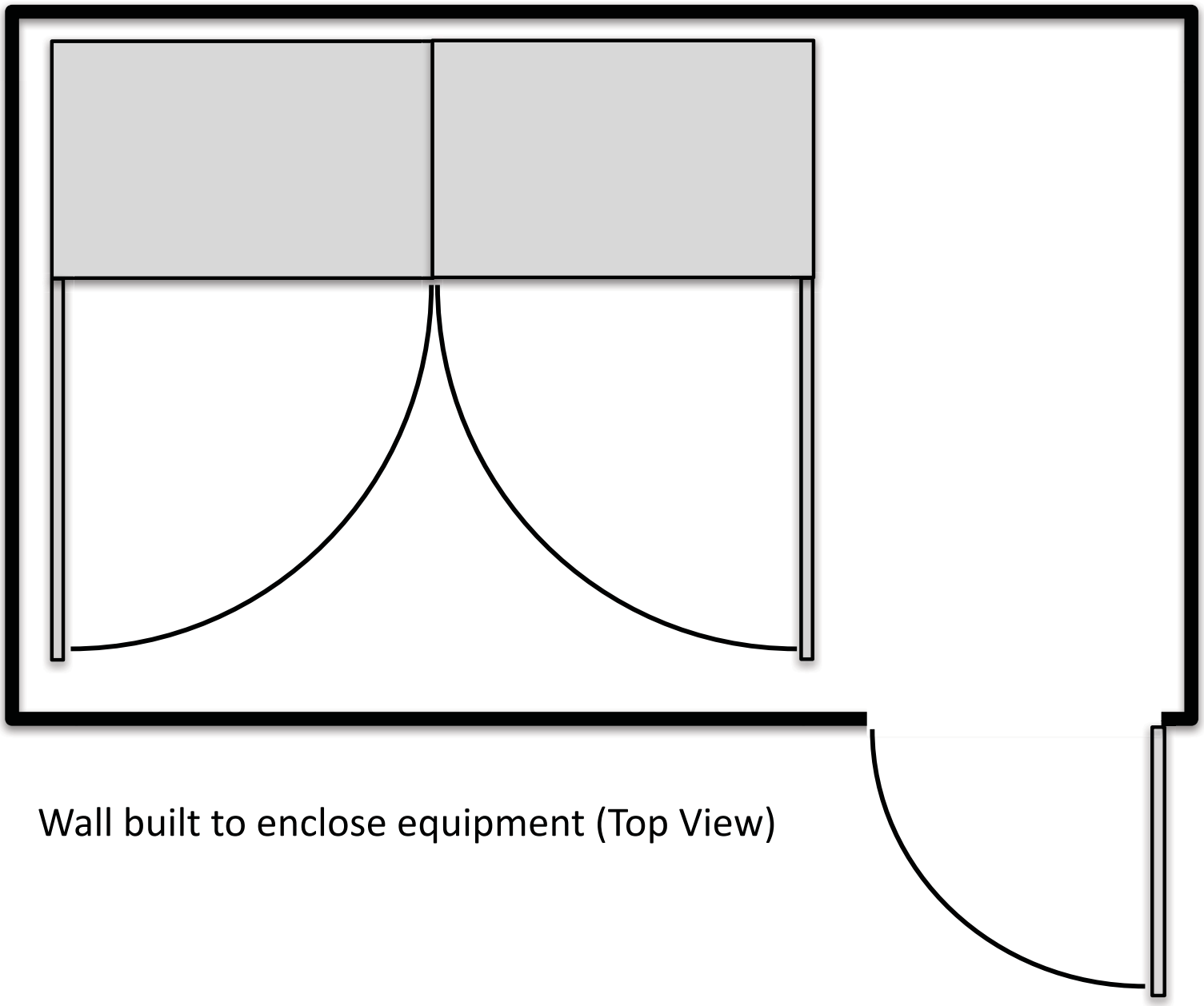
Typical Switchboard 3R Enclosure with doors



Wall built to enclose equipment (Top View)

Typical Switchboard 3R Enclosure with doors



Wall built to enclose equipment (Top View)

Public Input No. 1599-NFPA 70-2017 [Section No. 110.26(C)(2)]

(2) Large Equipment.

For equipment rated 1200 amperes or more and over 1.8 m (6 ft) wide that contains overcurrent devices, switching devices, or control devices, there shall be one entrance to and egress from the required working space not less than 610 mm (24 in.) wide and 2.0 m (6½ ft) high at each end of the working space. Working spaces(s) containing Large equipment shall be provided with Emergency Illumination and shall comply with 700.16.

A single entrance to and egress from the required working space shall be permitted where either of the conditions in 110.26(C)(2)(a) or (C)(2)(b) is met.

(a) *Unobstructed Egress.* Where the location permits a continuous and unobstructed way of egress travel, a single entrance to the working space shall be permitted.

(b) *Extra Working Space.* Where the depth of the working space is twice that required by 110.26(A)(1), a single entrance shall be permitted. It shall be located such that the distance from the equipment to the nearest edge of the entrance is not less than the minimum clear distance specified in Table 110.26(A)(1) for equipment operating at that voltage and in that condition.

Statement of Problem and Substantiation for Public Input

These additional requirements in the new text is intended to address the potential hazard for personnel to egress an area in the dark that could also be injured by an Arc-flash that results in a total loss of power and normal lighting. The additional requirement for emergency lighting will provide a safer means for egress from the working space and hazard. The Building Code typically requires Emergency Lighting and Exit signage for Buildings and areas that exceeds occupancy loads, travel distances, Use Groups, ETC. This Change for NFPA 70 Art.110 is intended to address a potential Life Safety concern for personnel that during general maintenance or Service could be injured and unable to see the egress doors due to loss of normal lighting with-in these areas.

Submitter Information Verification

Submitter Full Name: Haywood Kines
Organization: Prince William County Building
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 02 08:16:57 EDT 2017

Public Input No. 2693-NFPA 70-2017 [Section No. 110.26(C)(2)]

(2) Large Equipment.

For equipment rated 1200 amperes or more and over 1.8 m (6 ft) wide that contains overcurrent devices, switching devices, ~~or~~ control devices, or where the combined ampere ratings of service disconnecting means installed in accordance with 230.71 is 1200 amperes or more, there shall be one entrance to and egress from the required working space not less than 610 mm (24 in.) wide and 2.0 m (6 1/2 ft) high at each end of the working space.

A single entrance to and egress from the required working space shall be permitted where either of the conditions in 110.26(C)(2)(a) or (C)(2)(b) is met.

(a) *Unobstructed Egress.* Where the location permits a continuous and unobstructed way of egress travel, a single entrance to the working space shall be permitted.

(b) *Extra Working Space.* Where the depth of the working space is twice that required by 110.26(A)(1), a single entrance shall be permitted. It shall be located such that the distance from the equipment to the nearest edge of the entrance is not less than the minimum clear distance specified in Table 110.26(A)(1) for equipment operating at that voltage and in that condition.

Statement of Problem and Substantiation for Public Input

The only proposed change is to add; "or where the combined ampere ratings of service disconnecting means installed in accordance with 230.71 is 1200 amperes or more". The Terra software underlines additional text.

This public input is safety driven and is intended to recognize the common practice of separating large services into multiple separate disconnecting means. A 1200 amp service disconnect is subject to the safety driven requirements in 110.26(C)(2). However, a design with two 600 amp service disconnects is not required to comply with 110.26(C)(2) while the same hazards exist.

This proposed revision is directed at only service equipment. This public input is safety driven in recognizing that the hazards presented with a single 1200 amp service disconnecting means are equal to the hazards presented by two 600 amp service disconnects.

Submitter Information Verification

Submitter Full Name: James Dollard
Organization: IBEW Local Union 98
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Submittal Date: Fri Aug 25 09:26:58 EDT 2017

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Public Input No. 3170-NFPA 70-2017 [Section No. 110.26(C)(2)]

(2) Large Equipment.

For equipment ~~rated 1200~~ rated 1000 amperes or more and over 1.8 m (6 ft) wide that contains overcurrent devices, switching devices, or control devices, there shall be one entrance to and egress from the required working space not less than 610 mm (24 in.) wide and 2.0 m (6½ ft) high at each end of the working space.

A single entrance to and egress from the required working space shall be permitted where either of the conditions in 110.26(C)(2)(a) or (C)(2)(b) is met.

(a) *Unobstructed Egress.* Where the location permits a continuous and unobstructed way of egress travel, a single entrance to the working space shall be permitted.

(b) *Extra Working Space.* Where the depth of the working space is twice that required by 110.26(A)(1), a single entrance shall be permitted. It shall be located such that the distance from the equipment to the nearest edge of the entrance is not less than the minimum clear distance specified in Table 110.26(A)(1) for equipment operating at that voltage and in that condition.

Statement of Problem and Substantiation for Public Input

1,000 amperes is the rating that the Code Committees have consistently selected at which Ground Fault Protection of Equipment for services, feeders, and branch circuits is required.
The 1,000 ampere threshold where GFPE shall be installed and tested for operability has remained consistent in the Code for several Code cycles, in Sections 230.95, 215.10,and in 517.17 Health Care Facilities.
In the 2014 NEC, the same requirement was added via new Section 210.13.
This proposal provides consistency and usability.

Submitter Information Verification

Submitter Full Name: Michael Weitzel
Organization:
Street Address:
City:
State:
Zip:
Submittal Date: Sat Sep 02 09:55:41 EDT 2017

Public Input No. 3548-NFPA 70-2017 [Section No. 110.26(C)(3)]

(3) Personnel Doors.

Where equipment rated 800 A or more that contains overcurrent devices, switching devices, or control devices is installed and there is a personnel door(s) intended for entrance to and egress from the working space less than 7.6 m (25 ft) from the nearest edge of the working space, the door(s) shall open in the direction of egress and be equipped with listed panic hardware or listed fire exit hardware .

Informational Note: For information on panic hardware, see UL 305, Standard For Safety For Panic Hardware. For fire exit hardware, see UL 305, Standard For Panic Hardware and UL 10C, Standard for Safety for Positive Pressure Fire Tests of Door Assemblies.

Additional Proposed Changes

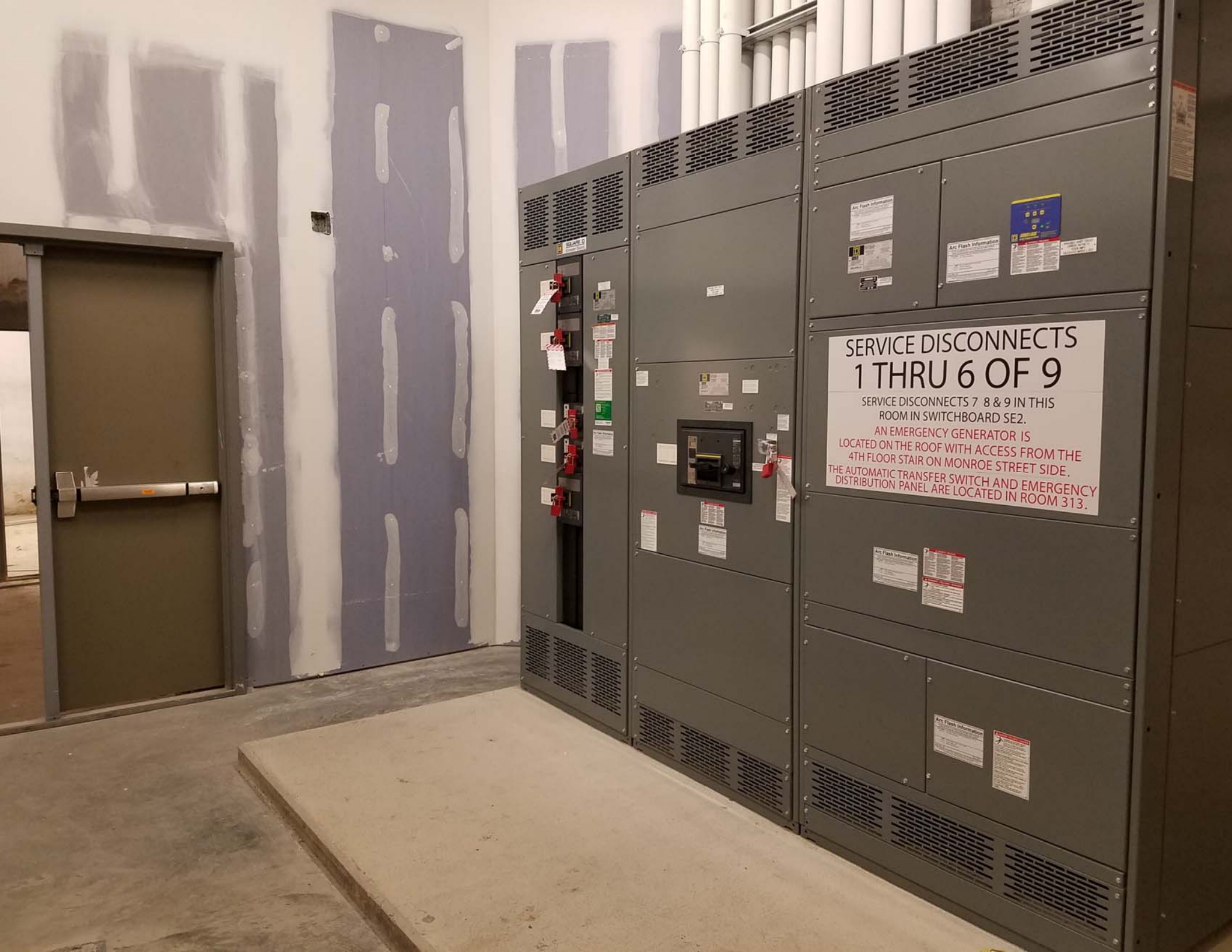
File Name	Description	Approved
Egress_Door_w_Panic_Hardware.jpg	Egress Door with Panic Hardware listed as Fire Exit	✓
Panic_Hardware_UL_Listed_3.jpg	Egress Door with Panic Hardware listed as Fire Exit 2	✓
Panic_Hardware_UL_Listed_6.jpg	Egress Door with Panic Hardware listed as Fire Exit 3	✓
Panic_Hardware_UL_Listed_9.jpg	VS Panic Hardware listed as Panic Hardware	✓

Statement of Problem and Substantiation for Public Input

REASON: Adding listed fire exit hardware as an alternative to listed panic hardware will correlate with the terminology used in the building and fire codes. Panic hardware is used for egress doors installed in a non-fire-resistance rated wall whereas fire exit hardware is used for egress doors installed in a fire-resistance rated wall. As currently written, an AHJ may not accept hardware listed as "Fire Exit Hardware" as it is not identified as "Panic Hardware." Both panic hardware and fire exit hardware are listed to UL 305. However, fire exit hardware is additionally tested to UL 10C. Adding the new Informational Note will assist those applying the NEC Section 110.3(C).

Submitter Information Verification

Submitter Full Name: Jeffrey Fecteau
Organization: Underwriters Laboratories LLC
Street Address:
City:
State:
Zip:
Submittal Date: Wed Sep 06 13:17:16 EDT 2017


SERVICE DISCONNECTS
1 THRU 6 OF 9
SERVICE DISCONNECTS 7 8 & 9 IN THIS ROOM IN SWITCHBOARD SE2.
AN EMERGENCY GENERATOR IS LOCATED ON THE ROOF WITH ACCESS FROM THE 4TH FLOOR STAIR ON MONROE STREET SIDE.
THE AUTOMATIC TRANSFER SWITCH AND EMERGENCY DISTRIBUTION PANEL ARE LOCATED IN ROOM 313.


971239-00
c UL US LISTED
FIRE EXIT HARDWARE
ISSUE NO.
U-1025
99 SERIES
Conforms with standards
UL 10C and UBC 7-2 (1997)
VON DUPRIN INDPLS, IN

97123900

C UL US LISTED

FIRE EXIT HARDWARE

ISSUE NO. U-1025

99 SERIES

Conforms with standards
UL 10C and UBC 7-2 (1997)

VON DUPRIN INDPLS. IN


C UL US
LISTED
261M
PANIC HARDWARE

Public Input No. 692-NFPA 70-2017 [Section No. 110.26(C)(3)]

(3) Personnel Doors.

Where equipment rated 800 A or more that contains overcurrent devices, switching devices, or control devices is installed and there is a personnel door(s) intended for entrance to and egress from the working space less than 7.6 m (25 ft) from the nearest edge of the working space, the door(s) shall open in the direction of egress and be equipped with listed panic or fire exit hardware.

Statement of Problem and Substantiation for Public Input

Some electrical rooms are required by other section of this code and other NFPA Standards to be enclosed with fire rated construction. Doors in fire rated assemblies are required to be listed fire-rated doors and the installation of panic hardware on fire doors is prohibited by the Life Safety Code and other model building codes. For examples of areas that require fire rated separation see section 450.21(B) of NFPA 70 and Section 7.2 of NFPA 110. NFPA 101, Section 7.2.1.7.2 prohibits the installation of panic hardware on fire rated doors along with other model building codes.

Submitter Information Verification

Submitter Full Name: Matt Ruhrer
Organization: Hdr Inc
Affilliation: Self
Street Address:
City:
State:
Zip:
Submittal Date: Fri May 12 14:08:59 EDT 2017

Public Input No. 1094-NFPA 70-2017 [Section No. 110.26(D)]

(D) Illumination.

Illumination shall be provided for all working spaces about service equipment, switchboards, switchgear, panelboards, or motor control centers installed indoors. Control by automatic means ~~only~~ shall not be permitted. 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 Input

See related PI 1432
This is a worker safety issue and it was first raised during the 1996 NEC revision cycle. The original proposal was 1-171 and it was rejected because "No documentation is offered to substantiate that a hazard exists". Comment 1-137 recommended that proposal 1-171 be accepted and the panel accepted the comment in principle and revised section 110-16(e). The panel revision added a second sentence which read "In electrical equipment rooms the illumination shall not be controlled by automatic means only". There was no explanation in the panel statement about why automatic control would be allowed.

During the 2017 NEC revision cycle PI 550 was submitted to delete the word "only" in the current text of 110.26(D). First revision No.19 revised the wording to the section but the word "only" remains and the panel did not state why this word was not deleted as proposed.

In today's world energy conservation is very important and energy codes are being adopted by most jurisdictions but worker safety is paramount. By allowing the word "only" to remain, a designer could install one luminaire that was not automatically controlled and put the remainder of the lights on automatic control. While an electrician is working within the room the automatic control could turn off 99% of the fixtures leaving the worker in almost total darkness depending on where the one fixture is located.

Still don't understand this last paragraph.....
By the word "only" inserted in the section it is implied that some sort of bypass switch is required to be installed that will override the automatic control of the lighting. If the panel wants to continue to allow automatic control of the illumination required by 110.26(D) then requirements must be detailed for the installation of the bypass switch or manual override of the automatic control system. Should the override device be within sight of the electrical equipment? Should the override device be readily accessible? If not in sight of the electrical equipment should the override device be capable of being locked in the override position?

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 1432-NFPA 70-2017 [Section No. 110.34(D)]	

Submitter Information Verification

Submitter Full Name: David Hittinger
Organization: Independent Electrical Contractors
Affilliation: Independent Electrical Contractors Codes and Standard
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jun 30 13:36:16 EDT 2017

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Public Input No. 3442-NFPA 70-2017 [Section No. 110.26(D)]

(D) Illumination.

Illumination shall be provided for all working spaces about service equipment, switchboards, switchgear, panelboards, or motor control centers installed indoors. Control by automatic means only shall not be permitted. 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.

(E) Emergency Illumination.

An emergency lighting system shall automatically illuminate the areas around electrical service equipment greater than 200 amperes for a duration of not less than 90 minutes.

Statement of Problem and Substantiation for Public Input

To provide INGRESS AND egress illumination in the event of a power failure -- especially when the power failure is the result of an accident at the service. Previous responses to this proposal refer to building codes and NFPA 101. Sections 1008 (Means of Egress Illumination) and Setion 1009 (Accessible Means of Egress) of the ICC's International Building Code do not contemplate the condition in which a power failure caused the outage to begin with and that there would be no illumination for worker rescue. NFPA 101 refers to the IBC which effectively creates a do-nothing loop which should be remedied in an NEC section that sets general rules for electrical safety..

Submitter Information Verification

Submitter Full Name: Michael Anthony
Organization: Standards Michigan
Street Address:
City:
State:
Zip:
Submittal Date: Wed Sep 06 08:22:29 EDT 2017

Public Input No. 3587-NFPA 70-2017 [Section No. 110.26(E) [Excluding any Sub-Sections]]

All switchboards, switchgear, panelboards, cutout boxes installed and used as service disconnecting means, 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 Input

A fused cutout or enclosed circuit breaker switch that is installed and used as a service disconnecting means should clearly require dedicated space for worker safety and protection from physical damage. However this might be construed or assumed, by those who work with the Code, it is not specifically required in the Code today.
This simple added text provides clarity to designers, installers, and those who enforce the Code, that a fused service disconnect, with renewable parts (fuses) definitely requires dedicated workspace and protection.

Submitter Information Verification

Submitter Full Name: Michael Weitzel
Organization:
Street Address:
City:
State:
Zip:
Submittal Date: Wed Sep 06 14:20:41 EDT 2017

Public Input No. 451-NFPA 70-2017 [Section No. 110.26(E) [Excluding any Sub-Sections]]

All 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 Input

This material is already covered in 110.27(B).

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Ryan Jackson
Street Address:
City:
State:
Zip:
Submittal Date: Fri Mar 31 14:29:38 EDT 2017

Public Input No. 1789-NFPA 70-2017 [Section No. 110.26(E)(1)]

(1) Indoor.

Indoor installations shall comply with 110.26(E)(1)(a) through (E)(1)(d).

(a) ~~*Dedicated Electrical*~~ *Dedicated Equipment 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.

Statement of Problem and Substantiation for Public Input

Changing the text "Dedicated Electrical Space" to "Dedicated Equipment Space" would minimize confusion with 110.26(A) "Working Spaces", 110.26(A) is about minimum clearances for "workers" (Working Spaces) around equipment for their personal safety when working on equipment. 110.26(E) is about minimum spaces around equipment to allow conduits, cables etc. to be installed to the equipment. I believe "Electrical Space" is too broad in nature.

Submitter Information Verification

Submitter Full Name: Kevin Nutley
Organization: Puget Sound Electrical JATC
Street Address:
City:
State:
Zip:
Submittal Date: Fri Aug 04 20:48:32 EDT 2017

Public Input No. 1806-NFPA 70-2017 [Section No. 110.26(E)(1)]

(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~~ 91 m (~~6 ft~~ 3 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~~

91 -m (

~~6~~

3 -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.

Statement of Problem and Substantiation for Public Input

The reason for this space is for future access six feet above this equipment is excessive, three feet is more than adequate and allows more flexibility in the field when install the equipment

Submitter Information Verification

Submitter Full Name: Alfio Torrisi
Organization: Master electrician
Street Address:
City:
State:
Zip:
Submittal Date: Sun Aug 06 09:38:00 EDT 2017

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Public Input No. 1808-NFPA 70-2017 [Section No. 110.26(E)(2)]

(2) Outdoor.

Outdoor installations shall comply with 110.26(E)(2)(a)through (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.

Exception: Structural overhangs or roof extensions shall be permitted 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~~ 91 m (~~6 ft~~ 3 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.

Statement of Problem and Substantiation for Public Input

same as PI 1806

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 1806-NFPA 70-2017 [Section No. 110.26(E)(1)]	

Submitter Information Verification

Submitter Full Name: Alfio Torrisi
Organization: Master electrician
Street Address:
City:
State:
Zip:
Submittal Date: Sun Aug 06 09:57:46 EDT 2017

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Public Input No. 2867-NFPA 70-2017 [Section No. 110.26(E)(2)]

(2) Outdoor.

Outdoor installations shall comply with 110.26(E)(2)(a)through (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.

~~Exception: Structural overhangs or roof extensions shall be permitted 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 Input

The exception under 110.26(E)(2)(b) should be under 110.26(E)(2)(c). The terms “structural overhangs” and “roof extensions” were submitted in public inputs as an exception under dedicated equipment space which at the time was 110.26(E)(2)(b). When the Code-making committee made a statement about this new exception, they referenced “(b)” and at the time, “(b)” was dedicated equipment space. Code-Making Panel No. 2 also made a statement saying keeping this zone completely clear in outdoor locations is not practical in all cases; and wiring methods could be routed through nonstructural overhangs or roof extensions to safely be installed to such equipment.

Submitter Information Verification

Submitter Full Name: Charles Miller
Organization: Charles R. Miller Electrical Education and Training
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 28 14:50:01 EDT 2017

Public Input No. 3226-NFPA 70-2017 [Section No. 110.26(E)(2)]

(2) Outdoor.

Outdoor installations shall comply with 110.26(E)(2)(a)through (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.

~~Exception:~~ ~~Structural overhangs or roof extensions shall be permitted 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 Input

The intent of the 2017 public input which created the new exception was to address structural overhangs and roof extensions that encroach into the dedicated equipment space required for outdoor equipment. The misplacement of the new exception gives permission for structural overhangs and roof extensions to encroach into the required working space for the outdoor equipment which was never the intent.

Submitter Information Verification

Submitter Full Name: Mike Miller
Organization: ElectricalLicenseRenewal.com
Street Address:
City:
State:
Zip:
Submittal Date: Mon Sep 04 13:14:20 EDT 2017

Public Input No. 446-NFPA 70-2017 [Section No. 110.26(E)(2)]

(2) Outdoor.

Outdoor installations shall comply with 110.26(E)(2)(a) through (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.

Exception: Structural overhangs or roof extensions shall be permitted 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.

Statement of Problem and Substantiation for Public Input

My intent is only to delete item 3, pertaining to piping systems. Terraview seems to have the list formatted as a table, so you must either delete all of it or none of it.
Protecting outdoor equipment from a pipe dripping water on it seems rather odd, considering that the enclosure must be rated for the location to begin with.

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Ryan Jackson
Street Address:
City:
State:
Zip:
Submittal Date: Fri Mar 31 14:03:49 EDT 2017

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Public Input No. 447-NFPA 70-2017 [Section No. 110.26(E)(2)]

(2) Outdoor.

Outdoor installations shall comply with 110.26(E)(2)(a) through (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.~~

~~*Exception: Structural overhangs or roof extensions shall be permitted 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 Input

The working space required by 110.26(A) isn't optional. By adding it here we confuse the issue (what is "working clearance space" anyway?) by seemingly combing it with the dedicated space provisions in 110.26(E).

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Ryan Jackson
Street Address:
City:
State:
Zip:
Submittal Date: Fri Mar 31 14:08:46 EDT 2017

Public Input No. 2659-NFPA 70-2017 [Section No. 110.26(F)]

~~**(F)** Locked Electrical Equipment Rooms or Enclosures.~~

~~Electrical equipment rooms or enclosures housing electrical apparatus that are controlled by a lock(s) shall be considered accessible to qualified persons.~~

Statement of Problem and Substantiation for Public Input

With the definition of "Accessible, Readily" telling us equipment that requires a key to access is readily accessible, there in no need for this section as it tells us that equipment requiring a key to access is only accessible.

Submitter Information Verification

Submitter Full Name: Don Ganiere
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 24 11:29:08 EDT 2017

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Public Input No. 2672-NFPA 70-2017 [Section No. 110.26(F)]

~~**(F)** Locked Electrical Equipment Rooms or Enclosures.~~

~~Electrical equipment rooms or enclosures housing electrical apparatus that are controlled by a lock(s) shall be considered accessible to qualified persons.~~

Statement of Problem and Substantiation for Public Input

This section can safely be deleted. Due to the recent revisions to the Article 100 definition of "readily accessible", it is now clear that breakers or fuses located behind a locked door are still considered "readily accessible". Keeping this section could in fact cause confusion because of the different terminology used. eg. "accessible" versus "readily accessible".

Submitter Information Verification

Submitter Full Name: Russ Leblanc
Organization: Leblanc Consulting Services
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 24 20:08:03 EDT 2017

Public Input No. 41-NFPA 70-2017 [Section No. 110.26(F)]

(F) Locked Electrical Equipment Rooms or Enclosures.

Electrical equipment rooms or enclosures housing electrical apparatus that are controlled by a lock(s) shall be considered readily accessible to qualified persons.

Statement of Problem and Substantiation for Public Input

The 2017 NEC added language to the definition of Accessible, Readily that a key is not considered a tool. Since the use of a key is not a tool to gain access, electrical equipment that is housed in equipment rooms or within enclosures controlled by locks are considered to be readily accessible, not accessible.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 43-NFPA 70-2017 [Definition: Accessible (as applied to equipment).]	PI-41 proposes a change to "shall be considered readily accessible"

Submitter Information Verification

Submitter Full Name: Brian Baughman
Organization: Generac Power Systems Inc
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jan 24 15:31:01 EST 2017

Public Input No. 3158-NFPA 70-2017 [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~~

a. circuit conductors

b. A minimum of 2.6 m (8 ft 6 in.) for 301 volts to

~~600 volts~~

a. 1000 volts between

~~ungrounded~~

a. circuit conductors

(6) ~~A minimum of 2.62 m (8 ft 7 in.) for 601 volts to 1000 volts between ungrounded conductors~~

Additional Proposed Changes

File Name	Description	Approved
Reference_PI_3158.1504301002678.docx	PI 3158	✓

Statement of Problem and Substantiation for Public Input

The TerraView software would not format this PI correctly please see attached Word Document.
The current wording only applies where there are two ungrounded conductors as the voltage references are all "between ungrounded" conductors. With that wording, the rule does not seem to apply where the circuit consists of a grounded and an ungrounded conductor. The PI changes "ungrounded" to circuit conductors. This change will make it clear that the rules apply both where the circuit consists of multiple ungrounded conductors or a grounded and ungrounded conductor.
The current rule has only a one inch difference between the requirements for 301 to 600 volts, and the requirements for 601 to 1000 volts. This PI changes the requirement to 8'7" for 301 to 1000 volts. There is no good reason to have a one inch difference between these two rules.

Submitter Information Verification

Submitter Full Name: Don Ganiere
Organization: [Not Specified]
Street Address:

City:

State:

Zip:

Submittal Date: Fri Sep 01 17:14:22 EDT 2017

Copyright Assignment

I, Don Ganiere, hereby irrevocably grant and assign to the National Fire Protection Association (NFPA) all and full rights in copyright in this Public Input (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 Input in this or another similar or derivative form is used. I hereby warrant that I am the author of this Public Input and that I have full power and authority to enter into this copyright assignment.

☑ By checking this box I affirm that I am Don Ganiere, 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

Reference PI 3158. The TerraView software would not format this PI correctly 110.27(A)

(4) By elevation above the floor or other working surface as follows:
a. A minimum of 2.5 m (8 ft) for 50 volts to 300 volts between ~~ungrounded~~ circuit conductors
b. A minimum of 2.6 m (8 ft 7 in.) for 301 volts to ~~600~~ volts between ~~ungrounded~~ circuit conductors
~~c. A minimum of 2.62 m (8 ft 7 in.) for 601 volts to 1000 volts between ungrounded conductors~~

Don Ganiere
Ottawa, Illinois
Resqcapt19@aol.com

Public Input No. 4325-NFPA 70-2017 [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, cage or similar enclosure that is accessible only to qualified persons.

(2) By permanent, substantial partitions or screens arranged on all sides and above 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

Statement of Problem and Substantiation for Public Input

Exterior switchgear with exposed live parts should be guarded above live parts to prevent access by persons, animals, drones or other objects that enter the space from above.

Submitter Information Verification

Submitter Full Name: Michael Anthony
Organization: Standards Michigan
Street Address:
City:
State:
Zip:
Submittal Date: Thu Sep 07 21:07:08 EDT 2017

Public Input No. 452-NFPA 70-2017 [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~~

a. 1,000 volts between ungrounded conductors

(7) ~~A minimum of 2.62 m (8 ft 7 in.) for 601 volts to 1000 volts between ungrounded conductors~~

Statement of Problem and Substantiation for Public Input

The difference between items b and c are so miniscule as to be almost laughable. Is that one inch difference really worth having in the Code?

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Ryan Jackson
Street Address:
City:
State:
Zip:
Submittal Date: Fri Mar 31 14:30:40 EDT 2017

Copyright Assignment

I, Ryan Jackson, hereby irrevocably grant and assign to the National Fire Protection Association (NFPA) all and full rights in copyright in this Public Input (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 Input in this or another similar or derivative form is used. I hereby warrant that I am the author of this Public Input and that I have full power and authority to enter into this copyright assignment.

☑ By checking this box I affirm that I am Ryan Jackson, 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 Input No. 1802-NFPA 70-2017 [Section No. 110.27(B)]

(B) ~~Prevent Physical Damage~~ Prevent Damage .

In locations where electrical equipment is likely to be exposed ~~to physical damage~~ or subject to damage , enclosures or guards shall be so arranged and of such strength as to prevent such damage.

Statement of Problem and Substantiation for Public Input

Protection from physical damage is very important to a safe electrical installation. However, there are other forms of damage. Chemical damage from corrosion for example. Damage could be defined as "harm that impairs safety of usefulness, or creates an electrical hazard." Any type of damage is not desirable. A new requirement was added - appropriately - in Article 680 regarding protection of corrosion for equipment in pool equipment rooms. This requirement should be more global, and not simply for pool equipment in Article 680, and raceways in 300.6.
A PI has been submitted in Article 100 for a NEW Definition of Damage.

Submitter Information Verification

Submitter Full Name: Michael Weitzel
Organization:
Street Address:
City:
State:
Zip:
Submittal Date: Sat Aug 05 12:27:10 EDT 2017

Public Input No. 263-NFPA 70-2017 [Section No. 110.28]

110.28 Enclosure Types.

~~Enclosures~~
Table 110.28 shall be used for selecting enclosures (other than surrounding fences or walls ~~covered in 110.31~~) of switchboards, switchgear, 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~~ 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 conduit or unsealed openings.

~~(A) Marking.~~ ~~Enclosures (other than surrounding fences or walls covered in 110.31) of switchboards, switchgear, 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 .~~

(B) Mounting of Type 3R and 3RX Enclosures in Damp or Wet Locations. In damp or wet locations, enclosures that are specified in 110.28 and marked with an enclosure-type number of Type 3R or 3RX shall be placed or equipped so as to prevent moisture from entering or accumulating within the enclosure. Drainage openings not smaller than 3 mm (1?8 in.) and not larger than 6 mm (1?4 in.) in diameter shall be permitted to be installed in the field in enclosures marked with an enclosure-type number of Type 3R or 3RX in accordance with manufacturer's instructions. For installation of listed drain fittings, larger openings are permitted to be installed in the field in accordance with manufacturer's instructions.

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

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
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	—	—	—

*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, 5, 12, 12K, and 13.

Informational Note No. 2: Ingress protection (IP) ratings may be found in

ANSI/IEC

60529, *Degrees of Protection Provided by Enclosures*. IP ratings are not a substitute for Enclosure Type ratings.

Additional Proposed Changes

File Name	Description	Approved
Public_Input_No._263-NFPA_70-2017_Section_No._110.28_minus_TerraView-induced_unintended_changes.docx	legistlatively revised text of 110.28 as intended by Public Input No 263, not as corrupted by TerraView.	✓

Statement of Problem and Substantiation for Public Input

Re-ordering of NEC® 110.28 for useability and to include explicit enforceability of plumb mounting of Type 3R and 3RX enclosures.

Presently, NEC® 110.28 expresses marking ahead of selection. This Public Input rearranges 110.28 so that selection is located in the main text, ahead of the Enclosure Type marking requirement now UNCHANGED in a new sub-Section (A).

Absence of plumb alignment of Type 3R (and 3RX) entrance panel enclosures has been identified as one of the top 14 reasons electrical service installations get red-tagged. Such mismounted enclosures do not drain propoerly.

reference: http://ecmweb.com/contractor/top-14-reasons-electrical-service-installations-get-red-tagged#slide-2-field_images-134491

Consequently, the wording of NEC® 314.15 for outlet boxes in damp and wet locations has been adapted in a new sub-Section (B) to address this issue of Type 3R/3RX enclosure mounting more enforceably than relying on interpretations of NEC® 110.12.

NOTE TO CMP: Contrary to the intended revisions, the TerraView app has underlined or crossed out UNCHANGED

portions of the text and Table. SEE THE ATTACHED DOCX MSWORD FILE THAT INDICATES LEGISLATIVELY THE REVISIONS AND ADDITIONS INTENDED BY PUBLIC INPUT NO 263. The relocated and revised MAIN TEXT and sub-Section headings SHOULD be underlined, as SHOULD the content of new sub-Section (B). The content of sub-Section (A) and ENTIRE Table 110.28 SHOULD NOT be underlined; no changes were intended by this Public Input to those. By this Public Input, this REVISED Section 110.28, minus TerraView-introduced revisions, SHOULD read as follows:

110.28 Enclosure Types.
Table 110.28 shall be used for selecting enclosures (other than surrounding fences or walls covered in 110.31) of switchboards, switchgear, 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 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 conduit or unsealed openings.
.
(A) Marking. Enclosures (other than surrounding fences or walls covered in 110.31) of switchboards, switchgear, 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.
.
(B) Mounting of Type 3R and 3RX Enclosures in Damp or Wet Locations. In damp or wet locations, enclosures that are specified in 110.28 and marked with an enclosure-type number of Type 3R or 3RX shall be placed or equipped so as to prevent moisture from entering or accumulating within the enclosure. Drainage openings not smaller than 3 mm (1/8 in.) and not larger than 6 mm (1/4 in.) in diameter shall be permitted to be installed in the field in enclosures marked with an enclosure-type number of Type 3R or 3RX in accordance with manufacturer's instructions. For installation of listed drain fittings, larger openings are permitted to be installed in the field in accordance with manufacturer's instructions.
.
Table 110.28 Enclosure Selection [UNCHANGED]

Submitter Information Verification

Submitter Full Name: Brian Rock
Organization: Hubbell Incorporated
Street Address:
City:
State:
Zip:
Submittal Date: Sun Feb 19 16:11:30 EST 2017

Revised text for Public Input No. 263-NFPA 70-2017 [Section No. 110.28]

*The following indicates what is intended to be revised text for **Public Input No 263** and is legislatively closed-captioned for the TerraView-impaired.*

110.28 Enclosure Types. ~~Enclosures (other than surrounding fences or walls covered in 110.31) of switchboards, switchgear, 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 conduit or unsealed openings.

(A) Marking. Enclosures (other than surrounding fences or walls covered in 110.31) of switchboards, switchgear, 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.

(B) Mounting of Type 3R and 3RX Enclosures in Damp or Wet Locations. In damp or wet locations, enclosures that are specified in 110.28 and marked with an enclosure-type number of Type 3R or 3RX shall be placed or equipped so as to prevent moisture from entering or accumulating within the enclosure. Drainage openings not smaller than 3 mm (1/8 in.) and not larger than 6 mm (1/4 in.) in diameter shall be permitted to be installed in the field in enclosures marked with an enclosure-type number of Type 3R or 3RX in accordance with manufacturer's instructions. For installation of listed drain fittings, larger openings are permitted to be installed in the field in accordance with manufacturer's instructions.

*Table 110.28 Enclosure Selection [**UNCHANGED**]*

Public Input No. 2669-NFPA 70-2017 [Section No. 110.28]

110.28 Enclosure Types.

Enclosures (other than surrounding fences or walls covered in 110.31) of switchboards, switchgear, 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 conduit or unsealed openings.

Informational Note No. 2: Dusttight rated enclosures are permitted in hazardous locations in accordance with Sections 502.10(B)(4), 503.10(A)(2), and 506.15(C)(8).

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	—	—	—

*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, 5, 12, 12K, and 13.

Informational Note No. 2: Ingress protection (IP) ratings may be found in ANSI/IEC 60529, *Degrees of Protection Provided by Enclosures*. IP ratings are not a substitute for Enclosure Type ratings.

Statement of Problem and Substantiation for Public Input

There is confusion in the field that Types 3 3, 3X, 3SX, 3X, 5, 12, 12K, and 13 enclosures that are permitted to marked as "dusttight' are not suitable for any hazardous locations. These rated enclosures are suitable for use in hazardous locations that contain dust in accordance with the sections identified in the new proposed Informational Note.

Submitter Information Verification

Submitter Full Name: Vince Baclawski
Organization: Nema
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 24 15:11:50 EDT 2017

Public Input No. 2699-NFPA 70-2017 [Section No. 110.28]

110.28 Enclosure Types.

Enclosures (other than surrounding fences or walls covered in 110.31) of switchboards, switchgear, 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 conduit or unsealed openings.

Informational Note No. 1: Enclosure Type 3, 3S, 3SX, 4, 4X, 5, 6, 6P, 12, 12K, and 13 are considered dusttight and suitable 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	—	—	—

*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, 5, 12, 12K, and 13.

Informational Note No. 2: Ingress protection (IP) ratings may be found in ANSI/IEC 60529, *Degrees of Protection Provided by Enclosures*. IP ratings are not a substitute for Enclosure Type ratings.

Statement of Problem and Substantiation for Public Input

Readability of the Code and correlation with requirements elsewhere (Article 100 “Dusttight” definition and Articles 500, 502, 503 and 506) in the Code. The second paragraph of 110.28, while not inaccurate, has been frequently misconstrued and has resulted in incorrect interpretations.
The first sentence of the second paragraph indicates that Table 110.28 itself, AS A TABLE, is used for the SELECTION of Enclosure Types for “other than hazardous (classified) locations”. By contrast, the second sentence speaks to the enclosures (Enclosure Types) themselves rather than to the Table.
What the first sentence does NOT say is that those Enclosure Types are unsuitable for hazardous (classified) locations permitting dusttight enclosures elsewhere* in the Code. Nonetheless, many have confused this second paragraph to reject eligible dusttight enclosures of Types 3, 3S, 3SX, 4, 4X, 5, 6, 6P, 12, 12K, and 13 from Class II, Division 2; Class III; and Zone 22 hazardous (classified) locations.
Inclusion of and adaption of Informational Note No.1 from the Article 100 definition for “Dusttight” immediately adjacent to this second paragraph of 110.28 would clarify the eligibility of these dusttight Enclosure Types for hazardous (classified) locations.
* 500.7(C), 500.8(C)(6)(b), 502.10(B)(4), 502.115(B), 502.120(B), 502.125 Exception, 502.130(B)(2), 502.150(B)(1), 503.10(A)(2), 503.115, 503.120, 506.8(D)

Submitter Information Verification

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Submittal Date: Fri Aug 25 10:28:35 EDT 2017

Public Input No. 3575-NFPA 70-2017 [Section No. 110.28]

110.28 Enclosure Types.

Enclosures (other than surrounding fences or walls covered in 110.31) of switchboards, switchgear, 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 conduit or unsealed openings. Enclosures Types 2, 3R, or 3RX shall be installed vertically, unless marked for other orientations in accordance with their listing.

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	—	—	—

*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, 5, 12, 12K, and 13.

Informational Note No. 2: Ingress protection (IP) ratings may be found in ANSI/IEC 60529, *Degrees of Protection Provided by Enclosures*. IP ratings are not a substitute for Enclosure Type ratings.

Statement of Problem and Substantiation for Public Input

REASON: The orientation of an enclosure can affect the ability of the enclosure to provide the expected degree of protection against environmental conditions. Section 9.51 of UL 50E requires that if the acceptability of a Type 2, 3R, or 3RX enclosure is dependent upon a particular mounting orientation, the enclosure shall be marked to indicate the required orientation unless the mounting is obvious. Obvious to whom? That would be the person performing the test, not the installer or the AHJ.

Unfortunately, there are many installations where those enclosures are installed in an orientation other than how it was tested. For example, many PV systems have Type 3R enclosures installed parallel with the roof surface, where the enclosure does not provide the level of protection anticipated due to the orientation.

Submitter Information Verification

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Submittal Date: Wed Sep 06 13:59:30 EDT 2017

Public Input No. 420-NFPA 70-2017 [Section No. 110.28]

110.28 Enclosure Types.

Enclosures (other than surrounding fences or walls covered in 110.31) of switchboards, switchgear, 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 conduit 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	—	—	—

*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, 5, 12, 12K, and 13.

Informational Note No. 2: Ingress protection (IP) ratings may be found in ANSI/IEC 60529, *Degrees of Protection Provided by Enclosures*. IP ratings are not a substitute for Enclosure Type ratings.

Statement of Problem and Substantiation for Public Input

Usability and layout of Table 110.28
In TerraView Table 110.28 is in the proper placement, but in the printed edition this Table 110.28 (page 70-50) is shown after Section 110.31 has started. It also is after Part III Over 1000 volts, Nominal has started so it appears that this table is in Part III when it actually is part of Part II in Article 110.
This is or can be confusing to users of the NEC. When instructing on code arrangement and layout this becomes an issue especially to new users of the code. If this was done at the printing stage in the development process it needs to be addressed by a Production Manager or team to exam typesetting, page layout, and proofreading to ensure the quality and accuracy in the finished printed product.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 418-NFPA 70-2017 [Section No. 90.3]	Layout/usability
Public Input No. 419-NFPA 70-2017 [Section No. 110.26(A)(1)]	Layout/usability

Submitter Information Verification

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Submittal Date: Wed Mar 29 17:46:03 EDT 2017

Public Input No. 453-NFPA 70-2017 [Section No. 110.28]

110.28 Enclosure Types.

Enclosures (other than surrounding fences or walls covered in 110.31) of switchboards, switchgear, 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 conduit~~ 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	—	—	—

*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, 5, 12, 12K, and 13.

Informational Note No. 2: Ingress protection (IP) ratings may be found in ANSI/IEC 60529, *Degrees of Protection Provided by Enclosures*. IP ratings are not a substitute for Enclosure Type ratings.

Statement of Problem and Substantiation for Public Input

This change addresses a simple misapplication of terms. All conduits are raceways, not all raceways are conduits (EMT for example is not a conduit).

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Submittal Date: Fri Mar 31 14:33:12 EDT 2017

Public Input No. 1928-NFPA 70-2017 [Section No. 110.31(A)(4)]

(4) Locks.

Doors shall be equipped with locks, and doors shall be kept locked, with access allowed only to qualified persons. Personnel doors ~~shall swing out and~~ shall open in the direction of egress and be equipped ~~with panic bars, pressure plates, or other devices that are normally latched but that open under simple pressure~~ with listed panic hardware .

Statement of Problem and Substantiation for Public Input

Listed Panic Hardware replaced the rather lengthy language in 110.26(C)(3) in the 2014 NEC (Personnel doors shall swing out and be equipped with panic bars, pressure plates, or other devices that are normally latched but that open under simple pressure). This will be in keeping with the ongoing alignment of language throughout the NEC.

Submitter Information Verification

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Submittal Date: Tue Aug 08 15:36:14 EDT 2017

Public Input No. 693-NFPA 70-2017 [Section No. 110.31(A)(4)]

(4) Locks.

Doors shall be equipped with locks, and doors shall be kept locked, with access allowed only to qualified persons. Personnel doors shall swing out and be equipped with listed panic ~~bars, pressure plates, or other devices that are normally latched but that open under simple pressure~~ hardware or fire exit hardware .

Statement of Problem and Substantiation for Public Input

Panic Hardware is not permitted to be installed on fire rated doors. Some electrical equipment rooms are required to be enclosed with fire rated construction and doors in fire rated walls are required to be fire rated. See previous submittal under section 110.26(C).

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 692-NFPA 70-2017 [Section No. 110.26(C)(3)]	Same Condition

Submitter Information Verification

Submitter Full Name: Matt Ruhrer
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Submittal Date: Fri May 12 15:07:10 EDT 2017

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☑ By checking this box I affirm that I am Matt Ruhrer, 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 Input No. 776-NFPA 70-2017 [Section No. 110.31(A)(4)]

(4) Locks.

Doors shall be equipped with locks, and doors shall be kept locked, with access allowed only to qualified persons. Personnel doors shall ~~swing out~~ open in the direction of egress and be equipped with ~~panic bars, pressure plates, or other devices that are normally latched but that open under simple pressure~~ listed panic hardware .

Statement of Problem and Substantiation for Public Input

Listed Panic Hardware replaced the rather lengthy language in 110.26(C)(3) in the 2014 NEC (Personnel doors shall swing out and be equipped with panic bars, pressure plates, or other devices that are normally latched but that open under simple pressure). This will be in keeping with the ongoing alignment of language throughout the NEC

Submitter Information Verification

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Submittal Date: Sat May 20 15:12:45 EDT 2017

Public Input No. 2866-NFPA 70-2017 [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) ~~or~~ and not less than 914 mm (3 ft) wide (measured parallel to the equipment). 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.

Statement of Problem and Substantiation for Public Input

The minimum clear work space should be at least 2.0 m (61⁄2 ft) high and at least 914 mm (3 ft) wide. In accordance with the current wording, if the work space is at least 2.0 m (61⁄2 ft) high, there is no required width of work space. Likewise, if the width of the work space is at least 914 mm (3 ft), there is no required height of work space. It might be good to divide this section into two subsections; one for width of working space and one for height of working space.

Submitter Information Verification

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Submittal Date: Mon Aug 28 14:25:36 EDT 2017

Public Input No. 3165-NFPA 70-2017 [Section No. 110.32]

110.32 ~~Work~~ Working Space About Equipment.

Sufficient working space shall be provided and maintained about electrical equipment such as service equipment, switchgear, motor control equipment, overcurrent devices, or disconnecting means 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) or not less than 914 mm (3 ft) wide (measured parallel to the equipment). 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.

Statement of Problem and Substantiation for Public Input

Section 110.30 for Over 1,000 Volt Equipment states that the requirements in Article 110 Part 1 apply, but not Part II.
This minor but important revision clarifies for the design engineer, installer, and electrical inspector where working space is required.
In Section 314.72(D), working space is required for junction and pull boxes that contain circuits or systems that operate at over 1,000 volts, per Section 110.34.
This is a clear, understandable, measureable, enforceable requirement.
It is consistent with the objective of safe working space for personnel who work on or about energized electrical equipment.

Submitter Information Verification

Submitter Full Name: Michael Weitzel
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Submittal Date: Fri Sep 01 23:43:21 EDT 2017

Public Input No. 593-NFPA 70-2017 [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) ~~or not less than~~ and the width of the equipment or 914 mm (3 ft) wide (measured parallel to the equipment) which ever 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.

Statement of Problem and Substantiation for Public Input

The original text included the word "or" between the 6.5' height requirement and the 3' width requirement. NFPA technical question response stated this should have been an "and" function.
Adding the "width of the equipment" requirement to the 3' requirement duplicates the <1000 volt requirement.

Both changes would clarify the working space requirements.

Submitter Information Verification

Submitter Full Name: Carl Johnson II
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Submittal Date: Tue Apr 25 17:03:44 EDT 2017

Public Input No. 594-NFPA 70-2017 [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) or not less than 914 mm (3 ft) wide (measured parallel to the equipment). 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. Within the height requirements of this section, other equipment that is associated with the electrical installation and is located above or below the electrical equiment shall be permitted to extend not more than 150 mm (6 in.) beyond the front of the eletrial equipment.

Statement of Problem and Substantiation for Public Input

The existing text does not address the 6" requirement contained in the <1000 volt section.
OSHA 1910.303(h) applies the 6 inch requirement to equipment over 600 volts.
Incorporating the proposed text would bring the >1000 volt section into conformance with the <1000 volt section and comply with OSHA requirements.

Submitter Information Verification

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Submittal Date: Tue Apr 25 17:30:19 EDT 2017

Public Input No. 4327-NFPA 70-2017 [Section No. 110.33(A)(2)]

(2) Guarding.

Where bare energized parts at any voltage or insulated energized parts above 1000 volts, nominal, are located adjacent to such entrance, they shall be suitably guarded to prevent access by persons, animals, drones or other objects that enter the space from above . .

Statement of Problem and Substantiation for Public Input

This makes a more specific statement about making sure that exterior switchgear with exposed live parts should be guarded ABOVE above live parts to prevent access by persons, animals, drones or other objects that enter the space from above. Many utilities construct screens above their transformers and related switchgear to prevent rodents from causing flash-overs. Owing to the increasing use of drones we should be more specific about restricting vertical access for safety and security reasons.

Submitter Information Verification

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Submittal Date: Thu Sep 07 21:12:12 EDT 2017

Public Input No. 694-NFPA 70-2017 [Section No. 110.33(A)(3)]

(3) Personnel Doors.

Where there is a personnel door(s) intended for entrance to and egress from the working space less than 7.6 m (25 ft) from the nearest edge of the working space, the door(s) shall open in the direction of egress and be equipped with listed panic or fire exit hardware.

Statement of Problem and Substantiation for Public Input

Panic Hardware is not permitted to be installed on fire rated doors. Some electrical rooms are required to be enclosed in fire rated construction and doors in fire rated assemblies are required to be fire rated.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 693-NFPA 70-2017 [Section No. 110.31(A)(4)]	Same Condition
Public Input No. 692-NFPA 70-2017 [Section No. 110.26(C)(3)]	Same Condition

Submitter Information Verification

Submitter Full Name: Matt Ruhrer
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Affilliation: Self
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State:
Zip:
Submittal Date: Fri May 12 15:13:02 EDT 2017

Public Input No. 1432-NFPA 70-2017 [Section No. 110.34(D)]

(D) Illumination.

Illumination shall be provided for all working spaces about electrical equipment. Control by automatic means ~~only~~ shall not be permitted. The lighting outlets shall be arranged so that persons changing lamps or making repairs on the lighting system are not endangered by live parts or other equipment.

The points of control shall be located so that persons are not likely to come in contact with any live part or moving part of the equipment while turning on the lights.

Statement of Problem and Substantiation for Public Input

This is submitted to correlate 110.34(D) with 110.26(D). Please refer to related PI 1094.
This is a worker safety issue and it was first raised during the 1996 NEC revision cycle. The original proposal was 1-171 and it was rejected because "No documentation is offered to substantiate that a hazard exists". Comment 1-137 recommended that proposal 1-171 be accepted and the panel accepted the comment in principle and revised section 110-16(e). The panel revision added a second sentence which read "In electrical equipment rooms the illumination shall not be controlled by automatic means only". There was no explanation in the panel statement about why automatic control would be allowed. During the 2017 NEC revision cycle PI 550 was submitted to delete the word "only" in the current text of 110.26(D). First revision No.19 revised the wording to the section but the word "only" remains and the panel did not state why this word was not deleted as proposed.
In today's world energy conservation is very important and energy codes are being adopted by most jurisdictions but worker safety is paramount. By the word "only" inserted in the section it is implied that some sort of bypass switch is required to be installed that will override the automatic control of the lighting. If the panel wants to continue to allow automatic control of the illumination required by 110.26(D) then requirements must be detailed for the installation of the bypass switch or manual override of the automatic control system. Should the override device be within sight of the electrical equipment? Should the override device be readily accessible? If not in sight of the electrical equipment should the override device be capable of being locked in the override position?

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 1094-NFPA 70-2017 [Section No. 110.26(D)]	

Submitter Information Verification

Submitter Full Name: David Hittinger
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Affilliation: Independent Electrical Contractors Codes and Standard
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Submittal Date: Sun Jul 30 11:56:15 EDT 2017

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Public Input No. 2932-NFPA 70-2017 [Annex A]

Informative Annex A Product Safety Standards

Informative Annex A is not a part of the requirements of this NFPA document but is included for informational purposes only.

This informative annex provides a list of product safety standards used for product listing where that listing is required by this *Code*. It is recognized that this list is current at the time of publication but that new standards or modifications to existing standards can occur at any time while this edition of the *Code* is in effect.

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Product Standard Name Product Standard	Product Standard Number
Horticultural Lighting Equipment	UL 8800

Statement of Problem and Substantiation for Public Input

A proposal to revise NEC Article 410 to add a new Part XVI - Special Provisions for Lighting Equipment Identified for Horticultural Use, was submitted for consideration for the 2020 Code cycle. This new proposal requires horticultural lighting equipment to be listed.

This companion proposal includes a suggested revision to Annex A to add reference to the UL safety publication used to evaluate and List Horticultural Lighting Equipment. At present this publication is titled: UL 8800 - Outline of Investigation for Horticultural Lighting Equipment and well before the release of the 2020 NEC it will be available as a UL Standard. On this basis, the proposal is to reference it in Annex A as a Standard.

Submitter Information Verification

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Submittal Date: Tue Aug 29 11:05:39 EDT 2017

Public Input No. 3023-NFPA 70-2017 [Annex A]

Informative Annex A Product Safety Standards

Informative Annex A is not a part of the requirements of this NFPA document but is included for informational purposes only.

This informative annex provides a list of product safety standards used for product listing where that listing is required by this *Code*. It is recognized that this list is current at the time of publication but that new standards or modifications to existing standards can occur at any time while this edition of the *Code* is in effect.

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Product Standard Name Distributed Generation Cables

Product Standard Number UL 3003

Additional Proposed Changes

File Name	Description	Approved
PV_Industry_Forum.pdf		✓

Statement of Problem and Substantiation for Public Input

Add the UL Standard 3003 for Distributed Generation (DG) Cables to Annex A. Wiring methods listed to this standard are being used in PV systems.
Excerpt from Scope of UL 3003:
“These requirements cover multi-conductor, nonintegrally jacketed, distributed generation (DG) cable. The cable is intended for use with specific distributed generation equipment/devices such as photovoltaic modules, inverters, solar trackers, etc. DG Cable is suitable for use between cable trays and utilization.”

This PI was developed by the PV Industry Forum (PVIF).

Submitter Information Verification

Submitter Full Name: Philip Undercuffler
Organization: OutBack Power Technologies
Affilliation: PV Industry Forum
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 30 22:41:43 EDT 2017

The **PV Industry Forum (PVIF)** is a collaborative initiative of several organizations dedicated to continually improving the installation safety of PV systems in the U.S. The organizations are the Interstate Renewable Energy Council (IREC), the Large-Scale Solar Association (LSA), the PV Industry Codes Council (PVICC), the Solar Energy Industry Association (SEIA) and Solar Energy International (SEI). This coalition has come together to organize, convene, support and mentor solar industry professionals through the NEC public input process, which is open to all solar industry participants.

This collaborative effort has resulted in the consensus development of numerous solar-related Public Input proposals for consideration. The list of task group members indicates those individuals who have contributed to the development of various Public Inputs in nine different tasks groups. A consensus process was used to develop each Public Input, therefore this list does not necessarily indicate that each individual or their representative organization participated in or has agreed with every proposed Public Input submitted under the PVIF effort. Each participant has agreed that any original proposal that they submitted and which was subsequently improved by our process is assigned as original and / or improved work to PVIF for submittal and release to NFPA as a proposed Public Input.

Members of the PVIF's effort include:

Coordinating committee:
Bill Brooks, Brooks Solar and PVICC
Evelyn Butler and Joe Cain, Solar Energy Industry Association
Jason Fisher, Tesla / SEIA (Vice Chair, Codes & Standards Working Group)
Rebekah Hren and Brian Mehalic, Solar Energy International
Lee Kraemer, First Solar / Large-Scale Solar Association
Larry Sherwood, Interstate Renewable Energy Council

Conveners:
Mark Baldassari, Enphase Energy
Ward Bower, Ward Bower Innovations
Bill Brooks, PVICC
Dave Click, ESA Renewables
Adam Cordova,
Chris Deline, NREL
Jason Fisher, Tesla
Rebekah Hren, SEI
Brian Lydic, IREC
Lee Kraemer, First Solar
Ryan Mayfield, Renewable Associates
Brian Mehalic , SEI
Isaac Opalinsky, SunPower
Charles Picard, Tesla
Larry Sherwood, IREC
Philip Undercuffler, OutBack Power
Dave White,
Robert Wills, InterGrid

Task Group Members (alphabetical last name):

Hasib Amin, SunPower
Mark Baldassari, Enphase Energy
Greg Ball, Tesla
John Berdner, HiQ Solar
Jason Bobruk, SolarEdge
Kyle Bolger, Blue Planet Energy
Ward Bower, Ward Bower Innovations & SEIA
Jeanette Brasher, Unirac
Bill Brooks, Brooks Solar & PVICC
Logan Boutilier, DNV GL
Evelyn Butler, SEIA
Joe Cain, SEIA
Brandon Carlson, New Day Solar
Sudipta Chakraborty, NREL
Dave Click, ESA Renewables
Tim Coats, SunPower
Michael Coddington, NREL
Kate Collardson, Certain Teed/St. Gobain
David Conover, PNNL
Adam Cordova
James Cormican, RBI Solar
Chris Crane, Sunrun
Marv Dargatz, Kaylaco Enterprises
Charlie Dearie, McCalmont Engineering
Chris Deline, NREL
Jeff Fecteau, UL
Randy Fish
Jason Fisher, Tesla & SEIA
Chris Fox, SunPower
Christopher Freitas, Redback Technologies
Todd Fries, Hellerman Tyton
Ajay Friesen, SunPower
Matt Germain, Ampt
Marina Golden, SunPower
Philippe Gregoire, Canadian Solar
Jeni Hall, Oregon Energy Trust
Marvin Hamon, Hamon Engineering
Sarah Harrington, Sunrun
Daniel Harsadi, Baywa R.E.
Bryan Holland, NEMA
John Holmes, UCSD
Rebekah Hren, SEI
Raymond Hudson, DNV GL
Stoli Jäger, Bentek
Sagar Khare, Maxim Integrated
Nick Korth, Hellerman Tyton
Lee Kraemer, First Solar & LSA
Chuck Ladd, BV
Olga Lavrova, Sandia Labs
Brian Lydic, IREC
Jacob Marshall, SunPower
Evan Martin, Burndy
Ryan Mayfield, Renewable Associates
Brian Mehalic, SEI
Tom McCalmont, McCalmont Engineering
Klaus Nicolaedis, Unirac
Isaac Opalinsky, SunPower
Matt Paiss, IAFF
Leo Patnode, Enphase Energy
Ted Petsas, SunPower
Charles Picard, Tesla
Loren Powers, DNV GL
Sumitha Raj, Daimler
Blair Reynolds, Enphase Energy
Paul Robusto, MiaSole
Mark Rodriguez, Sunrun
Miles Russell, Solectria
Alkesh Shah, First Solar
Jon Sharp, Schneider Electric Solar
Devan Shea, Burndy
Larry Sherwood, IREC
Bijay Shrestha, Tigo Energy
Chris Sommerfeld, Sunrun
Ryan Stankevitz, Sensata
Tim Stocker, SMA
Gerry Tortorice, Sunstreet Energy
Philip Undercuffler, OutBack Power
Laura Walters, SEI
Thomas Wegener, SMA
Carol Weis, Sun Energy Power
Dave White, Bentek
Will White, SEI
Sean White, Sean White
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Rob Wills, Intergrid
Benjamin Wong, SunPower
Steve Wozniak, First Solar
Tim Zgonena, UL

Public Input No. 3176-NFPA 70-2017 [Annex A]

Informative Annex A Product Safety Standards

Informative Annex A is not a part of the requirements of this NFPA document but is included for informational purposes only.

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Additional Proposed Changes

File Name	Description	Approved
.1504386964528	Additional ANSI standards	✓

Statement of Problem and Substantiation for Public Input

As a Standards Development Organization, UL is continuing working with industry to update and create standards for the evolving market place.
Over the past several years, UL has helped issue three ANSI approved standards relating to motors, specifically:
UL 1004-6 Servo and Stepper Motors – This standard covers the evaluation of servo and stepper motors
UL 1004-7 Electronically Protected motors – This standard covers the evaluation and reliability of motors employing solid state and/or software as overheating protection.
UL 1004-8 Inverter Duty Motors – This standard covered motor for use with Inverters (sometimes called converters).
UL 1004-9 Medium Voltage and Form Wound motors – This standard covers motors using standard random wound construction rated in excess of 1000V and motors employing form wound winding constructions rated in excess of 460V with a maximum voltage limit (for both constructions) being 34kV.
UL 60034-1 Rotating Electrical Machines – Rating and Performance – In response to the growing influence of IEC-based standards, UL recently adopted UL 60034-1. This standard covers basic rating and performance aspects for motors primarily used in industrial applications.
These standards are all ANSI approved and therefore represent accepted, consensus standards in use today.
This PI proposes to update Informative Annex A to reference these ANSI approved standards supplementing those motor standards currently referenced in the Annex.

Submitter Information Verification

Submitter Full Name: Kirk Anderson
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Submittal Date: Sat Sep 02 17:03:08 EDT 2017

Copyright Assignment

I, Kirk Anderson, hereby irrevocably grant and assign to the National Fire Protection Association (NFPA) all and full rights in copyright in this Public Input (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 Input in this or another similar or derivative form is used. I hereby warrant that I am the author of this Public Input and that I have full power and authority to enter into this copyright assignment.

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Public Input No. 3189-NFPA 70-2017 [Annex A]

Informative Annex A Product Safety Standards

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This informative annex does not form a mandatory part of the requirements of this *Code* but is intended only to provide *Code* users with informational guidance about the product characteristics about which *Code* requirements have been based.

(Revise the following entries in Annex A as noted)

Circuit Integrity (CI) Cable — Tests for ~~Fire Resistive Cables~~ Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables	UL 2196
Fire Resistive Cables, Test s for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables	UL 2196

Statement of Problem and Substantiation for Public Input

The title of UL 2196 has been revised and needs to be updated in the NEC.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3180-NFPA 70-2017 [Global Input]	Title change for UL 2196

Submitter Information Verification

Submitter Full Name: John Kovacik
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Submittal Date: Sun Sep 03 11:16:09 EDT 2017

Public Input No. 3547-NFPA 70-2017 [Annex A]

Informative Annex A Product Safety Standards

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This informative annex does not form a mandatory part of the requirements of this *Code* but is intended ~~only to provide~~ *Code* ~~users with informational guidance about the product characteristics about which~~ *Code* to identify for the *Code* users the standards upon which *Code* requirements have been based.

Additional Proposed Changes

File Name	Description	Approved
Annex_A_-_Attachment_Identification_of_Standards_being_added_.doc	Identification of Standards being added to Annex A	✓
Annex_A_Attachment_PI_3547_.doc	Revised Annex A Table (Proposed)	✓

Statement of Problem and Substantiation for Public Input

While the standards shown in Annex A are not a mandatory part of the requirements, these standards are developed to be compatible with the Code. As noted in Section 90.7 “suitability shall be determined by application of requirements that are compatible with this Code”. Rewording of the introductory text aligns with the requirement in 90.7 regarding the use of Standards enumerated in Annex A.

Additionally, the current tabular format doesn’t provide correlation with various Code Articles. Reformatting the present list into a table will assist the user of this Code in determining which Articles, products, and systems apply with which standards. The list of Standards was also reviewed and Standards added that were deemed appropriate. Information included in an attachment to this Public Input identifies those Standards which have been added as part of this Public Input.

This Public Input is submitted on behalf of UL’s Electrical Council.

Submitter Information Verification

Submitter Full Name: Robert Osborne
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Submittal Date: Wed Sep 06 13:15:18 EDT 2017

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NOTE – This Attachment identifies Standards which were added to Annex A as part of this Public Input:

- All the Standard numbers in the table that are highlighted in "yellow" are currently referenced in the 2017 Annex A
- All the Standard numbers in the table that are highlighted in "green" are standards being added to Annex A
- All the Standard numbers in the table that are highlighted in "pink" are standards that are referenced in an Informational Note somewhere in the Code, but were never added to Annex A.

++

Article [1]	Standard Number	Standard Title
110	UL 310	Electrical Quick-Connect Terminals
	UL 305	Panic Hardware
	UL 486A - 486B	Wire Connectors
	UL 486C	Splicing Wire Connectors
	UL 486D	Sealed Wire Connector Systems
	UL 486E	Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors
	UL 486F	Bare and Covered Ferrules
	UL 486G	Sealed Twist-On Connecting Devices
	UL 510	Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape
	UL Subject 546	Conductor Termination Compounds
	UL 2459	Insulated Multi-Pole Splicing Wire Connectors
210	UL 943	Ground-Fault Circuit-Interrupters
	UL 1699	Arc-Fault Circuit-Interrupters
230	UL 1053	Ground-Fault Sensing and Relaying Equipment
	UL 2735	Electric Utility Meters
240	UL 198M	Mine-Duty Fuses
	UL 248-1	Low-Voltage Fuses — Part 1: General Requirements
	UL 248-2	Low-Voltage Fuses — Part 2: Class C Fuses
	UL 248-3	Low-Voltage Fuses — Part 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 Renewable Fuses
	UL 248-7	Low-Voltage Fuses — Part 7: Class H 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 248-13	Low-Voltage Fuses — Part 13: Semiconductor Fuses
	UL 248-14	Low-Voltage Fuses — Part 14: Supplemental Fuses
	UL 248-15	Low-Voltage Fuses — Part 15: Class T Fuses

	UL 248-16	Low-Voltage Fuses — Part 16: Test Limiters
	UL Subject 248-17	Low-Voltage Fuses – Part 17: Class CF Fuses
	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
250	UL 467	Grounding and Bonding Equipment
280	IEEE C62.1	Surge Arresters — Gapped Silicon-Carbide Surge Arresters for AC Power Circuits
	IEEE C62.11	Surge Arresters — Metal-Oxide Surge Arresters for AC Power Circuits
285	UL 1449	Surge Protective Devices
300	UL 263	Fire Tests of Building Construction and Materials
	UL Subject 267	Wire Pulling Compounds
	UL 514B	Conduit, Tubing, and Cable Fittings
	UL 635	Insulated Bushings
	UL 1479	Fire Tests of Through-Penetration Firestops
	UL 1565	Positioning Devices
	UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords
	UL 2043	Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces
	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
	UL Subject 2419	Electrically Conductive Corrosion Resistant Compounds
	UL 60730-1	Automatic Electrical Controls - Part 1: General Requirements
310	UL 44	Thermoset-Insulated Wires and Cables
	UL 66	Fixture Wire
	UL 83	Thermoplastic-Insulated Wires and Cables
	UL 1063	Machine-Tool Wires and Cables
312	UL 414	Meter Sockets
314	UL 50	Enclosures for Electrical Equipment
	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	UL 514A	Metallic Outlet Boxes
	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	UL 514D	Cover Plates for Flush-Mounted Wiring Devices
320	UL 4	Armored Cable
328	UL 1072	Medium-Voltage Power Cables
330	UL 1569	Metal-Clad Cables
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
338	UL 854	Service-Entrance Cables
340	UL 493	Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables

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
350	UL 360	Liquid-Tight Flexible Steel Conduit
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
358	UL 797A	Electrical Metallic Tubing — Aluminum
	UL 797	Electrical Metallic Tubing — Steel
360	UL Subject 1652	Flexible Metallic Tubing
362	UL 1653	Electrical Nonmetallic Tubing
368	UL 1953	Power Distribution Blocks
	UL Subject 509	Bus Drop Cable
	UL 857	Busways
374	UL 209	Cellular Metal Floor Raceways and Fittings
376	UL 870	Wireways, Auxiliary Gutters, and Associated Fittings
380	UL Subject 111	Multioutlet Assemblies
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
390	UL 884	Underfloor Raceways and Fittings
392	UL 568	Nonmetallic Cable Tray Systems
400	UL 62	Flexible Cords and Cables
	UL 817	Cord Sets and Power-Supply Cords
	UL Subject 1650	Portable Power Cable
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 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 1429	Pullout Switches

406	UL 498	Attachment Plugs and Receptacles
	UL 1682	Plugs, Receptacles, and Cable Connectors, of the Pin and Sleeve Type
408	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	UL 65	Wired Cabinets
	UL 153	Portable Electric Luminaires
	UL 496	Lampholders
	UL 542	Fluorescent Lamp Starters
	UL 588	Seasonal and Holiday Decorative Products
	UL 935	Fluorescent-Lamp Ballasts
	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
	UL 8754	Holders, Bases and Connectors for Solid-State (LED) Light Engines and Arrays
	UL	Horticultural Lighting Equipment

	Subject 8800	
411	UL 234	Low-Voltage Lighting Fixtures for Use in Recreational Vehicles
	UL 1838	Low-Voltage Landscape Lighting Systems
	UL 2108	Low-Voltage Lighting Systems
422	UL 22	Amusement and Gaming Machines
	UL 73	Motor-Operated 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 507	Electric Fans
	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 858	Household Electric Ranges
	UL 875	Electric Dry-Bath Heaters
	UL 921	Commercial Dishwashers
	UL 923	Microwave Cooking Appliances
	UL 962	Household and Commercial Furnishings
	UL 962A	Furniture Power Distribution Units
	UL 1017	Vacuum Cleaners, Blower Cleaners, and Household Floor Finishing Machines
	UL 1026	Household Electric Cooking and Food Serving Appliances
	UL 1278	Movable and Wall- or Ceiling-Hung Electric Room Heaters
	UL 1453	Electric Booster and Commercial Storage Tank Water Heaters
	UL 1727	Commercial Electric Personal Grooming Appliances
	UL 1776	High-Pressure Cleaning Machines
	UL 60335-2-40	Household and Similar Electrical Appliances, Part 2: Particular Requirements for Heating and Cooling
	UL 60335-2-24	Household and Similar Electrical Appliances, Part 2: Particular Requirements for Refrigerating Appliances, Ice-Cream Appliances, and Ice-makers
424	UL 499	Electric Heating Appliances
	UL 834	Heating, Water Supply, and Power Boilers - Electric
	UL 873	Temperature-Indicating and -Regulating Equipment
	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
426	UL Subject 1588	Roof and Gutter De-Icing Cable Units
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 508C	Power Conversion Equipment
	UL 845	Motor Control Centers
	UL 1004-1	Rotating Electrical Machines — General Requirements
	UL 1004-2	Impedance Protected Motors
	UL 1004-3	Thermally Protected Motors
	UL 2111	Overheating Protection for Motors
440	UL 250	Household Refrigerators and Freezers
	UL 412	Refrigeration Unit Coolers
	UL 416	Refrigerated Medical Equipment
	UL 427	Refrigerating Units
	UL 471	Commercial Refrigerators and Freezers
	UL 484	Room Air Conditioners
	UL 541	Refrigerated Vending Machines
	UL 563	Ice Makers
445	UL 1004-4	Electric Generators
450	UL 506	Specialty Transformers
	UL 5085-1	Low Voltage Transformers — Part 1: General Requirements
	UL 5085-2	Low Voltage Transformers — Part 2: General Purpose Transformers
	UL 1062	Unit Substations
	UL 1561	Dry-Type General Purpose and Power Transformers
	UL 1562	Transformers, Distribution, Dry-Type - Over 600 Volts
460	UL 810	Capacitors
	UL 810A	Electrochemical Capacitors
480	UL 1642	Lithium Batteries
	UL 1973	Batteries for Use in Light Electric Rail (LER) Applications and Stationary Applications
	UL 1989	Standby Batteries
	UL 2054	Household and Commercial Batteries
490	UL 347	Medium-Voltage AC Contactors, Controllers, and Control Centers
	UL Subject 347A	Medium Voltage Power Conversion Controllers
	UL Subject 347B	Medium Voltage Motor Controllers, Up to 15kV
	UL Subject 347C	Medium Voltage Solid State Resistive Load Controllers, Up to 15kV
500	ANSI/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
	ANSI/ISA-12.27.01	Requirements for Process Sealing Between Electrical Systems and Potentially Flammable or Combustible Process Fluids
	UL 698A	Industrial Control Panels Relating to 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 2075	Gas and Vapor Detectors and Sensors
	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
	UL 60079-29-1	Explosive Atmospheres - Part 29-1: Gas Detectors - Performance Requirements of Detectors for Flammable Gases
501	UL 60079-15	Electrical Apparatus for Explosive Gas Atmospheres — Part 15: Type of Protection “n”
	UL 60079-0	Explosive Gas Atmospheres — Part 0: Equipment- General requirements
	UL 60079-7	Explosive Gas Atmospheres — Part 7: Increased safety “e”
	UL 60079-1	Explosive Gas Atmospheres — Part 1: Type of protection – Flameproof “d”
	UL 60079-5	Explosive Gas Atmospheres — Part 5: Type of protection – Powder filling “q”
	UL 60079-6	Explosive Gas Atmospheres — Part 6: Type of protection – Oil immersion “o”
504	UL 913	Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous (Classified) Locations
505	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”
506	UL 61241-18	Electrical Apparatus for Use in Zone 20, Zone 21, and Zone 22 Hazardous (Classified) Locations — Protection by Encapsulation “mD”
	UL 61241-1	Electrical Apparatus for Use in Zone 21 and Zone 22 Hazardous (Classified) Locations — Protection by Enclosure “tD”
	UL 61241-0	Electrical Apparatus for Use in Zone 20, Zone 21, and Zone 22 Hazardous (Classified) Locations — General Requirements
	UL 61241-11	Electrical Apparatus for Use in Zone 20, Zone 21, and Zone 22 Hazardous (Classified) Locations — Protection by Intrinsic Safety “iD”
	UL 61241-2	Electrical Apparatus for Use in Zone 21 and Zone 22 Hazardous (Classified) Locations — Protection by Pressurization “pD”
511	UL 201	Garage Equipment
	UL 1564	Industrial Battery Chargers
517	UL 1022	Line Isolation Monitors
	UL 1047	Isolated Power Systems Equipment
	UL 60601-	Medical Electrical Equipment — Part 1: General Requirements for Safety

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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
550	UL Subject 1462	Mobile Home Pipe Heating Cable
551	UL 231	Power Outlets
600	UL 48	Electric Signs
	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 2161	Neon Transformers and Power Supplies
604	UL 183	Manufactured Wiring Systems
605	UL 1286	Office Furnishings
610	UL Subject 2273	Festoon Cable
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 1686	Pin and Sleeve Configurations
630	UL 551	Transformer-Type Arc-Welding Machines
640	UL 813	Commercial Audio Equipment
	UL 1419	Professional Video and Audio Equipment
	UL 1492	Audio-Video Products and Accessories
	UL 1711	Amplifiers for Fire Protective Signaling Systems
	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 1690	Data-Processing Cable
	UL 1778	Uninterruptible Power Systems

	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
646	UL Subject 2755	Modular Data Centers
670	UL 61800-5-1	Adjustable Speed Electrical Power Drive Systems - Part 5-1: Safety Requirements - Electrical, Thermal and Energy
680	UL 379	Power Units for Fountain, Swimming Pool, and Spa Luminaires
	UL 676	Underwater Luminaires and Submersible Junction Boxes
	UL 676A	Potting Compounds for Swimming Pool, Fountain, and Spa Equipment
	UL 1081	Swimming Pool Pumps, Filters, and Chlorinators
	UL 1241	Isolated Power Systems Equipment
	UL 1261	Electric Water Heaters for Pools and Tubs
	UL 1563	Electric Spas, Equipment Assemblies, and Associated Equipment
	UL 1795	Hydromassage Bathtubs
690	UL 98B	Enclosed and Dead-Front Switches for Use in Photovoltaic Systems
	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 Subject 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 Subject 2579	Low-Voltage Fuses — Fuses for Photovoltaic Systems
	UL Subject 3703	Solar Trackers
	UL Subject 3730	Photovoltaic Junction Boxes
	UL 4703	Photovoltaic Wire
	UL 6703	Connectors for Use in Photovoltaic Systems
	UL Subject 6703A	Multi-Pole Connectors for Use in Photovoltaic Systems
	UL Subject	Concentrator Photovoltaic Modules and Assemblies

	8703	
	UL Subject 9703	Distributed Wiring Harnesses
	UL 62109-1	Power Converters for use in Photovoltaic Power Systems - Part 1: General Requirements
694	UL Subject 489C	Molded-Case Circuit Breakers and Molded-Case Switches for Use with Wind Turbines
	UL Subject 6140	Wind Turbine Generating Systems
	UL 6141	Wind Turbines Permitting Entry of Personnel
	UL 6142	Wind Turbine Generating Systems — Small
695	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 1004-5	Fire Pump Motors
700	UL 924	Emergency Lighting and Power Equipment
	UL 1008	Transfer Switch Equipment
	UL 1008A	Medium-Voltage Transfer Switches
	UL 2200	Stationary Engine Generator Assemblies
706	UL 9540	Energy Storage Systems and Equipment
725	UL 5C	Surface Raceways and Fittings for Use with Data, Signal and Control Circuits
	UL 13	Power-Limited Circuit Cables
	UL 1012	Power Units Other Than Class 2
	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 5085-3	Low Voltage Transformers — Part 3: Class 2 and Class 3 Transformers
	UL Subject 9990	Information and Communication Technology (ICT) Power Cables
727	UL 2250	Instrumentation Tray Cable
728	UL Subject 1724	Fire Tests for Electrical Circuit Protective Systems
	UL 2196	Tests for Fire Resistive Cables
750	UL 916	Energy Management Equipment
760	UL 268	Smoke Detectors for Fire Alarm Signaling Systems
	UL 268A	Smoke Detectors for Duct Application
	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
770	UL 1651	Optical Fiber Cable
	UL 2024	Optical Fiber and Communication Cable Raceway
800	UL 444	Communications Cables
	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 1863	Communication Circuit Accessories
810	UL 150	Antenna Rotators
	UL 452	Antenna-Discharge Units
820	UL 1655	Community-Antenna Television Cables

Informative Annex A Product Safety Standards

Informative Annex A is not a part of the requirements of this NFPA document but is included for informational purposes only.

This informative annex provides a list of product safety standards used for product listing where that listing is required by this *Code*. It is recognized that this list is current at the time of publication but that new standards or modifications to existing standards can occur at any time while this edition of the *Code* is in effect.

This informative annex does not form a mandatory part of the requirements of this *Code* but is intended ~~only~~ to identify for the ~~provide~~ *Code* users ~~with informational guidance about the product characteristics about~~ the standards upon which *Code* requirements have been based.

Article [1]	Standard Number	Standard Title
110	UL 310	Electrical Quick-Connect Terminals
	UL 305	Panic Hardware
	UL 486A-486B	Wire Connectors
	UL 486C	Splicing Wire Connectors
	UL 486D	Sealed Wire Connector Systems
	UL 486E	Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors
	UL 486F	Bare and Covered Ferrules
	UL 486G	Sealed Twist-On Connecting Devices
	UL 510	Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape
	UL Subject 546	Conductor Termination Compounds
	UL 2459	Insulated Multi-Pole Splicing Wire Connectors
210	UL 943	Ground-Fault Circuit-Interrupters
	UL 1699	Arc-Fault Circuit-Interrupters
230	UL 1053	Ground-Fault Sensing and Relaying Equipment
	UL 2735	Electric Utility Meters
240	UL 198M	Mine-Duty Fuses
	UL 248-1	Low-Voltage Fuses — Part 1: General Requirements
	UL 248-2	Low-Voltage Fuses — Part 2: Class C Fuses
	UL 248-3	Low-Voltage Fuses — Part 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 Renewable Fuses
	UL 248-7	Low-Voltage Fuses — Part 7: Class H 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 248-13	Low-Voltage Fuses — Part 13: Semiconductor Fuses
	UL 248-14	Low-Voltage Fuses — Part 14: Supplemental Fuses
	UL 248-15	Low-Voltage Fuses — Part 15: Class T Fuses

	UL 248-16	Low-Voltage Fuses — Part 16: Test Limiters
	UL Subject 248-17	Low-Voltage Fuses – Part 17: Class CF Fuses
	UL 489	Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
250	UL 467	Grounding and Bonding Equipment
280	IEEE C62.1	Surge Arresters — Gapped Silicon-Carbide Surge Arresters for AC Power Circuits
	IEEE C62.11	Surge Arresters — Metal-Oxide Surge Arresters for AC Power Circuits
285	UL 1449	Surge Protective Devices
300	UL 263	Fire Tests of Building Construction and Materials
	UL Subject 267	Wire Pulling Compounds
	UL 514B	Conduit, Tubing, and Cable Fittings
	UL 635	Insulated Bushings
	UL 1479	Fire Tests of Through-Penetration Firestops
	UL 1565	Positioning Devices
	UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords
	UL 2043	Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces
	UL 2239	Hardware for the Support of Conduit, Tubing and Cable
	UL Subject 2419	Electrically Conductive Corrosion Resistant Compounds
	UL 60730-1	Automatic Electrical Controls - Part 1: General Requirements
310	UL 44	Thermoset-Insulated Wires and Cables
	UL 66	Fixture Wire
	UL 83	Thermoplastic-Insulated Wires and Cables
	UL 1063	Machine-Tool Wires and Cables
312	UL 414	Meter Sockets
314	UL 50	Enclosures for Electrical Equipment
	UL 50E	Enclosures for Electrical Equipment, Environmental Considerations
	UL 514A	Metallic Outlet Boxes
	UL 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
	UL 514D	Cover Plates for Flush-Mounted Wiring Devices
320	UL 4	Armored Cable
328	UL 1072	Medium-Voltage Power Cables
330	UL 1569	Metal-Clad Cables
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
338	UL 854	Service-Entrance Cables
340	UL 493	Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables

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
350	UL 360	Liquid-Tight Flexible Steel Conduit
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
358	UL 797A	Electrical Metallic Tubing — Aluminum
	UL 797	Electrical Metallic Tubing — Steel
360	UL Subject 1652	Flexible Metallic Tubing
362	UL 1653	Electrical Nonmetallic Tubing
368	UL 1953	Power Distribution Blocks
	UL Subject 509	Bus Drop Cable
	UL 857	Busways
374	UL 209	Cellular Metal Floor Raceways and Fittings
376	UL 870	Wireways, Auxiliary Gutters, and Associated Fittings
380	UL Subject 111	Multioutlet Assemblies
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
390	UL 884	Underfloor Raceways and Fittings
392	UL 568	Nonmetallic Cable Tray Systems
400	UL 62	Flexible Cords and Cables
	UL 817	Cord Sets and Power-Supply Cords
	UL Subject 1650	Portable Power Cable
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 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 1429	Pullout Switches

406	UL 498	Attachment Plugs and Receptacles
	UL 1682	Plugs, Receptacles, and Cable Connectors, of the Pin and Sleeve Type
408	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	UL 65	Wired Cabinets
	UL 153	Portable Electric Luminaires
	UL 496	Lampholders
	UL 542	Fluorescent Lamp Starters
	UL 588	Seasonal and Holiday Decorative Products
	UL 935	Fluorescent-Lamp Ballasts
	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
	UL 8754	Holders, Bases and Connectors for Solid-State (LED) Light Engines and Arrays
	UL	Horticultural Lighting Equipment

	Subject 8800	
411	UL 234	Low-Voltage Lighting Fixtures for Use in Recreational Vehicles
	UL 1838	Low-Voltage Landscape Lighting Systems
	UL 2108	Low-Voltage Lighting Systems
422	UL 22	Amusement and Gaming Machines
	UL 73	Motor-Operated 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 507	Electric Fans
	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 858	Household Electric Ranges
	UL 875	Electric Dry-Bath Heaters
	UL 921	Commercial Dishwashers
	UL 923	Microwave Cooking Appliances
	UL 962	Household and Commercial Furnishings
	UL 962A	Furniture Power Distribution Units
	UL 1017	Vacuum Cleaners, Blower Cleaners, and Household Floor Finishing Machines
	UL 1026	Household Electric Cooking and Food Serving Appliances
	UL 1278	Movable and Wall- or Ceiling-Hung Electric Room Heaters
	UL 1453	Electric Booster and Commercial Storage Tank Water Heaters
	UL 1727	Commercial Electric Personal Grooming Appliances
	UL 1776	High-Pressure Cleaning Machines
	UL 60335-2-40	Household and Similar Electrical Appliances, Part 2: Particular Requirements for Heating and Cooling
	UL 60335-2-24	Household and Similar Electrical Appliances, Part 2: Particular Requirements for Refrigerating Appliances, Ice-Cream Appliances, and Ice-makers
424	UL 499	Electric Heating Appliances
	UL 834	Heating, Water Supply, and Power Boilers - Electric
	UL 873	Temperature-Indicating and -Regulating Equipment
	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
426	UL Subject 1588	Roof and Gutter De-Icing Cable Units
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 508C	Power Conversion Equipment
	UL 845	Motor Control Centers
	UL 1004-1	Rotating Electrical Machines — General Requirements
	UL 1004-2	Impedance Protected Motors
	UL 1004-3	Thermally Protected Motors
	UL 2111	Overheating Protection for Motors
440	UL 250	Household Refrigerators and Freezers
	UL 412	Refrigeration Unit Coolers
	UL 416	Refrigerated Medical Equipment
	UL 427	Refrigerating Units
	UL 471	Commercial Refrigerators and Freezers
	UL 484	Room Air Conditioners
	UL 541	Refrigerated Vending Machines
	UL 563	Ice Makers
445	UL 1004-4	Electric Generators
450	UL 506	Specialty Transformers
	UL 5085-1	Low Voltage Transformers — Part 1: General Requirements
	UL 5085-2	Low Voltage Transformers — Part 2: General Purpose Transformers
	UL 1062	Unit Substations
	UL 1561	Dry-Type General Purpose and Power Transformers
	UL 1562	Transformers, Distribution, Dry-Type - Over 600 Volts
460	UL 810	Capacitors
	UL 810A	Electrochemical Capacitors
480	UL 1642	Lithium Batteries
	UL 1973	Batteries for Use in Light Electric Rail (LER) Applications and Stationary Applications
	UL 1989	Standby Batteries
	UL 2054	Household and Commercial Batteries
490	UL 347	Medium-Voltage AC Contactors, Controllers, and Control Centers
	UL Subject 347A	Medium Voltage Power Conversion Controllers
	UL Subject 347B	Medium Voltage Motor Controllers, Up to 15kV
	UL Subject 347C	Medium Voltage Solid State Resistive Load Controllers, Up to 15kV
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		and 2 Hazardous (Classified) Locations
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	UL 2225	Cable and Cable Fittings for Use in Hazardous (Classified) Locations
	UL 60079-29-1	Explosive Atmospheres - Part 29-1: Gas Detectors - Performance Requirements of Detectors for Flammable Gases
501	UL 60079-15	Electrical Apparatus for Explosive Gas Atmospheres — Part 15: Type of Protection “n”
	UL 60079-0	Explosive Gas Atmospheres — Part 0: Equipment- General requirements
	UL 60079-7	Explosive Gas Atmospheres — Part 7: Increased safety “e”
	UL 60079-1	Explosive Gas Atmospheres — Part 1: Type of protection – Flameproof “d”
	UL 60079-5	Explosive Gas Atmospheres — Part 5: Type of protection – Powder filling “q”
	UL 60079-6	Explosive Gas Atmospheres — Part 6: Type of protection – Oil immersion “o”
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505	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”
506	UL 61241-18	Electrical Apparatus for Use in Zone 20, Zone 21, and Zone 22 Hazardous (Classified) Locations — Protection by Encapsulation “mD”
	UL 61241-1	Electrical Apparatus for Use in Zone 21 and Zone 22 Hazardous (Classified) Locations — Protection by Enclosure “tD”
	UL 61241-0	Electrical Apparatus for Use in Zone 20, Zone 21, and Zone 22 Hazardous (Classified) Locations — General Requirements
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	UL 1564	Industrial Battery Chargers
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	UL 1047	Isolated Power Systems Equipment
	UL 60601-	Medical Electrical Equipment — Part 1: General Requirements for Safety

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	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 2161	Neon Transformers and Power Supplies
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	UL 1419	Professional Video and Audio Equipment
	UL 1492	Audio-Video Products and Accessories
	UL 1711	Amplifiers for Fire Protective Signaling Systems
	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 1690	Data-Processing Cable
	UL 1778	Uninterruptible Power Systems

	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
646	UL Subject 2755	Modular Data Centers
670	UL 61800-5-1	Adjustable Speed Electrical Power Drive Systems - Part 5-1: Safety Requirements - Electrical, Thermal and Energy
680	UL 379	Power Units for Fountain, Swimming Pool, and Spa Luminaires
	UL 676	Underwater Luminaires and Submersible Junction Boxes
	UL 676A	Potting Compounds for Swimming Pool, Fountain, and Spa Equipment
	UL 1081	Swimming Pool Pumps, Filters, and Chlorinators
	UL 1241	Isolated Power Systems Equipment
	UL 1261	Electric Water Heaters for Pools and Tubs
	UL 1563	Electric Spas, Equipment Assemblies, and Associated Equipment
	UL 1795	Hydromassage Bathtubs
690	UL 98B	Enclosed and Dead-Front Switches for Use in Photovoltaic Systems
	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 Subject 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 Subject 2579	Low-Voltage Fuses — Fuses for Photovoltaic Systems
	UL Subject 3703	Solar Trackers
	UL Subject 3730	Photovoltaic Junction Boxes
	UL 4703	Photovoltaic Wire
	UL 6703	Connectors for Use in Photovoltaic Systems
	UL Subject 6703A	Multi-Pole Connectors for Use in Photovoltaic Systems
	UL Subject	Concentrator Photovoltaic Modules and Assemblies

	8703	
	UL Subject 9703	Distributed Wiring Harnesses
	UL 62109-1	Power Converters for use in Photovoltaic Power Systems - Part 1: General Requirements
694	UL Subject 489C	Molded-Case Circuit Breakers and Molded-Case Switches for Use with Wind Turbines
	UL Subject 6140	Wind Turbine Generating Systems
	UL 6141	Wind Turbines Permitting Entry of Personnel
	UL 6142	Wind Turbine Generating Systems — Small
695	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 1004-5	Fire Pump Motors
700	UL 924	Emergency Lighting and Power Equipment
	UL 1008	Transfer Switch Equipment
	UL 1008A	Medium-Voltage Transfer Switches
	UL 2200	Stationary Engine Generator Assemblies
706	UL 9540	Energy Storage Systems and Equipment
725	UL 5C	Surface Raceways and Fittings for Use with Data, Signal and Control Circuits
	UL 13	Power-Limited Circuit Cables
	UL 1012	Power Units Other Than Class 2
	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 5085-3	Low Voltage Transformers — Part 3: Class 2 and Class 3 Transformers
	UL Subject 9990	Information and Communication Technology (ICT) Power Cables
727	UL 2250	Instrumentation Tray Cable
728	UL Subject 1724	Fire Tests for Electrical Circuit Protective Systems
	UL 2196	Tests for Fire Resistive Cables
750	UL 916	Energy Management Equipment
760	UL 268	Smoke Detectors for Fire Alarm Signaling Systems
	UL 268A	Smoke Detectors for Duct Application
	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
770	UL 1651	Optical Fiber Cable
	UL 2024	Optical Fiber and Communication Cable Raceway
800	UL 444	Communications Cables
	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 1863	Communication Circuit Accessories
810	UL 150	Antenna Rotators
	UL 452	Antenna-Discharge Units
820	UL 1655	Community-Antenna Television Cables

Footnote 1 – Products covered by this standard are primarily located in noted Article. These standards apply throughout the *Code* wherever these products are described.

Public Input No. 3952-NFPA 70-2017 [Annex A]

Informative Annex A Product Safety Standards

~~*Informative Annex A is not a part of the requirements of this NFPA document but is included for informational purposes only.*~~

~~This informative annex provides a list of product safety standards used for product listing where that listing is required by this *Code* . It is recognized that this list is current at the time of publication but that new standards or modifications to existing standards can occur at any time while this edition of the *Code* is in effect.~~

~~This informative annex does not form a mandatory part of the requirements of this *Code* but is intended only to provide *Code* users with informational guidance about the product characteristics about which *Code* requirements have been based.~~

61730-1 Photovoltaic (PV) Module Safety Qualification - Part 1: Requirements For Construction

61730-2 Photovoltaic (PV) Module Safety Qualification - Part 2: Requirements For Testing

UL 3003 Outline for Distributed Generation Cables

UL3741 Photovoltaic Hazard Control

Statement of Problem and Substantiation for Public Input

Substantiation- The following new standards are for renewable energy equipment and should be added to the Annex A . Please note that I accidentally deleted the Annex A explanitory text . It is not my intention to delete any text in Annex A but I could not undelete that text in terraview.

Submitter Information Verification

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Submittal Date: Thu Sep 07 10:18:17 EDT 2017

Public Input No. 3880-NFPA 70-2017 [Annex H [Excluding any Sub-Sections]]

Informative Annex H is not a part of the requirements of this NFPA document and is included for informational purposes only. This ~~informative~~ annex is ~~informative unless specifically adopted by the local jurisdiction~~ intended to provide a template and sample language for local jurisdictions adopting the National Electrical Code®.

Statement of Problem and Substantiation for Public Input

This clarification mimics the front page of many International Code Council products and may hasten the creation of administrative structures necessary to fully realize the stated purpose of the 2020 NEC.

Submitter Information Verification

Submitter Full Name: Michael Anthony
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Submittal Date: Thu Sep 07 07:10:03 EDT 2017

Public Input No. 3881-NFPA 70-2017 [Annex H [Title Only]]

Informative Annex A. Administration and Enforcement

Statement of Problem and Substantiation for Public Input

Admittedly, placing the Administration and Enforcement ahead of all the other Annexes is a large undertaking. I was a member of CMP-1 representing APPA.ORG during the original creation and was on the Task Group considered at length its numbering and placement so I understand the trade-offs. This public input is submitted simply to place it on the CMP agenda for consideration and re-consideration from time to time. .

Submitter Information Verification

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Submittal Date: Thu Sep 07 07:15:53 EDT 2017

Public Input No. 1363-NFPA 70-2017 [Section No. 80.1]

80.1 Scope.

The following functions are covered:

(1) The inspection of electrical installations as covered by 90.2

(2) The investigation of fires caused by electrical installations

(3) The review of construction plans, drawings, and specifications for electrical systems

(4) The design, alteration, modification, construction, maintenance, and testing of electrical systems and equipment

(5) The regulation and control of electrical installations at special events including but not limited to exhibits, trade shows, amusement parks, and other similar special ~~occupancies~~ ~~occupanc~~

(6) Any periodic electrical testing or inspections required by adopted codes, standards, or administrative procedures.

Statement of Problem and Substantiation for Public Input

The NEC (700.3), NFPA 303, and other codes and standards include requirements for periodic inspection and testing. Proposed text acknowledges that activity.

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Submittal Date: Thu Jul 27 08:09:20 EDT 2017

Public Input No. 3177-NFPA 70-2017 [Section No. 80.1]

80.1 Scope.

The following functions are covered:

(1) The inspection of electrical installations as covered by 90.2

(2) The investigation of fires caused by electrical installations

(3) The review of construction plans, drawings, and specifications for electrical systems

(4) The design, alteration, modification, construction, maintenance, and testing of electrical systems and equipment

(5) The regulation and control of electrical ~~installations at~~ installation safety at special events including but not limited to exhibits, trade shows, amusement parks, and other similar special occupancies

Statement of Problem and Substantiation for Public Input

Clarifies that the limit of Article 80 pertains to safety issues only.

Submitter Information Verification

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Submittal Date: Sat Sep 02 19:11:33 EDT 2017

Public Input No. 880-NFPA 70-2017 [Section No. 80.2]

80.2 Definitions.

Authority Having Jurisdiction. The organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

Chief Electrical Inspector. An electrical inspector who either is the authority having jurisdiction or is designated by the authority having jurisdiction and is responsible for administering the requirements of this *Code*.

Electrical Inspector. An individual meeting the requirements of 80.27 and authorized to perform electrical inspections.

Statement of Problem and Substantiation for Public Input

The definition in Annex H, 80.2 does not meet the definition of Authority Having Jurisdiction found in Article 100. The additional wording was a added in the 2008 National Electrical Code to match the NFPA Glossary of Terms.

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Public Input No. 3884-NFPA 70-2017 [Section No. 80.21(C)]

(C) Responsibility of the Authority Having Jurisdiction.

It shall be the responsibility of the authority having jurisdiction to promulgate rules that cover the following:

(1) Review of construction documents and drawings shall be completed within established time frames for the purpose of acceptance or to provide reasons for nonacceptance.

(2) Review and approval by the authority having jurisdiction shall not relieve the applicant of the responsibility of compliance with this *Code*.

(3) Where field conditions necessitate any substantial change from the approved plan, the authority having jurisdiction shall be permitted to require that the corrected plans be submitted for approval.

(4) The authority having jurisdiction shall be permitted to determine the scope of electrical power system rehabilitation independent of the requirements of the building code.

Statement of Problem and Substantiation for Public Input

The education facilities industry is the largest non-residential building construction market in the United States; building and renovating campus square footage at a clip of about $80 billion per year. Construction activity at the University of Michigan alone (with 36 million square feet under management and the largest campus in the US in terms of building square-footage) runs at an annual rate of $600 million to $ 1.2 billion annually so the evolution of electrical systems is in plain sight on a daily basis.

This proposal is intended to generate discussion about the degree to which the scope of electrical renovation/rehabilitation shall be permitted to be scaled according the site specific conditions that govern safety and economy. For example, many building codes may require that a 50% change in the square footage affected by a rehabilitation/renovation project may require a corresponding change in the electrical system. That change may or may not be justified on the basis of safety considerations alone. Conversely, the 50% criterion may not be a sufficient threshold to guarantee safety. While this model language for electrical administration may always be subordinate to the building codes, some model language that has been vetted through ANSI processes; that makes scalability a possibility would be welcomed from the standpoint of both both safety and economy

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Public Input No. 3178-NFPA 70-2017 [Section No. 80.33]

~~**80.33** Repeal of Conflicting Acts.~~

~~All acts or parts of acts in conflict with the provisions of Article 80 are hereby repealed.~~

Statement of Problem and Substantiation for Public Input

This provision suggests that Article 80 might supersede another safety regulation such as the International Building Code which customarily incorporates by reference the NEC and seems out of place. Its removal will likely not be missed and may actually strengthen Article 80 because its model provisions are limited. .

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Public Input No. 1365-NFPA 70-2017 [Section No. 80.9]

80.9 Application.

(A) New Installations.

This *Code* applies to new installations. Buildings with construction permits dated after adoption of this *Code* shall comply with its requirements.

(B) Existing Installations.

Existing electrical installations that do not comply with the provisions of this *Code* shall be permitted to be continued in use unless the authority having jurisdiction determines that the lack of conformity with this *Code* presents an imminent danger to occupants. Where changes are required for correction of hazards, a reasonable amount of time shall be given for compliance, depending on the degree of the hazard.

(C) Additions, Alterations, or Repairs.

Additions, alterations, or repairs to any building, structure, or premises shall conform to that required of a new building without requiring the existing building to comply with all the requirements of this *Code* . Additions, alterations, installations, or repairs shall not cause an existing building to become unsafe or to adversely affect the performance of the building as determined by the authority having jurisdiction. Electrical wiring added to an existing service, feeder, or branch circuit shall not result in an installation that violates the provisions of the *Code* in force at the time the additions are made.

(D) Periodic Inspections.

Where periodic inspections are required by this code or the authority having jurisidiction or other adopted standards, existing electrical installations that do not comply with the provisions of this *C* shall be permitted to be continued in use unless the authority having jurisdiction determines that the lack of conformity with the applicable requirement presents an imminent danger to occupants. Where changes are required for correction of hazards, a reasonable amount of time shall be given for compliance, depennding on the degree of the hazard.

Statement of Problem and Substantiation for Public Input

Review of NEC 90.1(B) reveals that proper maintenance is essential to the ongoing safety of electrical installations. In some applications, the NEC (700.3), other standards (NFPA 110, NFPA 303, etc) and possibly installations designated by the AHJ include the need for maintenance, testing, periodic inspections (pools, residential boat docks). In some jurisdictions, the Fire Service may perform those periodic inspections, while other jurisdictions may wish to perform the electrical portions of those inspections with an electrical inspector. Proposed text acknowledges an electrical inspector may have responsibilities for those duties.

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Public Input No. 1361-NFPA 70-2017 [Section No. 80.9(A)]

(A) New Installations.

This *Code* applies to new installations. ~~Buildings~~ Electrical installations with construction permits dated after adoption of this *Code* shall comply with its requirements.

Statement of Problem and Substantiation for Public Input

The scope of the NEC includes electrical installations both inside and outside "buildings". It is not uncommon to permit installations that never enter a building. Proposed text better correlates with current text in 80.9 (B) & (C).

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Public Input No. 1362-NFPA 70-2017 [Section No. 80.9(C)]

(C) Additions, Alterations, or Repairs.

Additions, alterations, or repairs to any building, structure, or premises shall conform to that required of a new ~~building~~ installation without requiring the existing ~~building~~ installation to comply with all the requirements of this *Code*. Additions, alterations, installations, or repairs shall not cause an existing ~~building~~ installation to become unsafe or to adversely affect the performance of the ~~building~~ installation as determined by the authority having jurisdiction. Electrical wiring added to an existing service, feeder, or branch circuit shall not result in an installation that violates the provisions of the *Code* in force at the time the additions are made.

Statement of Problem and Substantiation for Public Input

Revisions clarify the provisions apply inside and outside buildings where the NEC is applicable.

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Public Input No. 366-NFPA 70-2017 [Global Input]

Type your content here ...Remove reference to obsolete UL Standard 486A in informative annex I.

Statement of Problem and Substantiation for Public Input

Removal of UL 486A from the informative annex due to adoption of current UL 486A-486B at the end of the annex.

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Public Input No. 3882-NFPA 70-2017 [New Section after J.7.2]

Insert new Annex XXX Equipment Approval

Informative Annex XX Equipment Approval

This informational annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

Equipment Approval. NEC 110.2 mandates all conductors and equipment associated with this code be approved. Approved is a defined term. Information provided in this annex can be used to establish a basis for that approval.

Authority Having Jurisdiction (AHJ). Authority having jurisdiction is a defined term and that entity is responsible for approval of all conductors and equipment.

Application. The following NEC definitions and examples are provided to assist with application of the terms as they relate to electrical installations.

Application of Defined Terms

Approved. Acceptable to the authority having jurisdiction.

It is recognized the term “authority having jurisdiction (AHJ) includes a variety of individuals and/or organizations that may be responsible for approval of equipment.

AHJ’s generally establish a basis for approval of conductors and equipment in administrative or policy documents. That written document serves to maintain a clear and consistent approach to approval of products used and connected to electrical installations.

The term *approved* , as defined in Article 100 and required or permitted in Section 110.2, applies to acceptance by the authority having jurisdiction of all materials, equipment, and services. Therefore, this term shall be used in this sense, but only in this sense. On the other hand, materials, equipment, and services that have been listed are not inherently approved by the authority having jurisdiction in general or necessarily deemed by the authority having jurisdiction as suitable for the specific purpose, function, use, environment, or application.

In some cases, the AHJ (Insurance Company) may perform product evaluation and approval. See following example.

Insert pictures or figures to illustrate concept.

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.

Some electrical equipment is manufactured but not listed. Some reasons that condition exist include: specific product standards are not available, limited production with unique characteristics make listing difficult; the NEC does not require listing of the specific product; a collection of parts is assembled by a company not typically defined as a manufacturer; and many other reasons. Where those products are delivered to an electrical installation with no evidence the product complies with an applicable product standard, an AHJ may accept a field evaluation by an approved third party. The subsequent field evaluation, field evaluation marking, and associated report may be used for approval.

The following product is an assembly of products assembled offsite and field evaluated as a basis for approval.

Insert picture or figure for illustrate concept.

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.

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.

Equipment may be identified for use in specific environmental conditions such as an outdoor wet location. That identification may or may not be part of the third party certification of the product. The term *identified* , as defined in Article 100, applies to materials, equipment, or services being deemed as suitable for a specific

purpose, function, use, environment, or application. Therefore, this term shall be used in this sense, but only in this sense. On the other hand, any visual indications on materials or equipment for reasons other than expressing suitability for a specific purpose, function, use, environment, or application shall not be specified or referred to as being “identified”.

The following example is a product identified for use in an outdoor wet environment:

Insert picture of figure to illustrate concept.

The following example is a product that is not identified for use in an outdoor wet environment, but identified for use in a 1 hour fire resistant wall and identified for use as a floor box:

Insert picture or figure to illustrate concept.

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.

Some electrical equipment is manufactured and listed by an organization concerned with product evaluations, maintains periodic inspection of production of equipment, and also labeled as evidence the product complies with the appropriate product standard. Where that product is not damaged or altered, an AHJ may use that label as the basis for approval. It should be noted that all labeled equipment is also listed, but not all listed equipment is labeled. It should also be noted that listed or labeled equipment may not be approved if altered or damaged prior to or during installation. The term *labeled*, as defined in Article 100, applies to materials, equipment, or services that have been listed or field evaluated by a recognized and accredited certification body acceptable to the authority having jurisdiction and that bear some permanent, physical evidence of that certification accompanying that specific production lot of material or equipment or accompanying that specific serviced installation. Therefore, this term shall be used in this sense, but only in this sense. The evidence of listing or field evaluation is not necessarily in the form of an affixed or adhesive label, but the evidence method is publicly declared by the certification body in a manner accessible to the authority having jurisdiction. On the other hand, whether in the form of an affixed or adhesive label or not, equipment or material required or permitted to bear a visible indication, cautionary notification, or other marking for purposes unrelated to being listed or field evaluated shall not be specified or referred to as being “labeled”.

The following examples are products that are listed and labeled.

Insert pictures or figures to illustrate concept.

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.

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.

Some electrical equipment is manufactured and listed by an organization concerned with product evaluations, maintains periodic inspection of production of equipment. Those products may or may not also be labeled as evidence the product complies with the appropriate product standard. Where that product is not damaged or altered, an AHJ may use that listing as the basis for approval. It should be noted that all labeled equipment is also listed, but not all listed equipment is labeled. It should also be noted that listed equipment may not be approved if altered or damaged prior to or during installation. Additionally, listed equipment used outside the parameters of the listing may not be approved. The term *listed*, as defined in Article 100, applies to materials, equipment, or services that have been evaluated by a recognized and accredited certification body acceptable to the authority having jurisdiction. Therefore, this term should be used in this sense, but only in this sense. On the other hand, materials, equipment, or services that are tabulated, delineated, or referenced elsewhere within the Code or in other documents for purposes other than their evaluation to appropriate designated standards appropriate to determine their suitability for a specific purpose, function, use, environment, or application ~~shall~~ should not be specified or referred to as being “listed”.

The following example is a product that is listed and labeled.

Insert pictures or figures to illustrate conept.

The following example is a product that is listed, but not labeled.

Insert picture, figure, file to illustrate concept.

Certified is an undefined term used by OSHA and some certification bodies to describe the evaluation of equipment. The term is more inclusive and includes “listing” and “field evaluation”.

Additional Proposed Changes

File Name	Description	Approved
DONNY_COOK_Informative_Annex_XX_D1_8-16-17-2.pdf	Proposed annex text with illustrations	✓

Statement of Problem and Substantiation for Public Input

In May of 2015, the NEC Correlating Committee established a "listed and labeled" task group to review all definitions and associated informational notes relative to the use of the terms “listed”, “labeled”, “identified”, and “field labeled” and submit public comments to the definitions in Article 100 where necessary. This task group was requested to clarify and establish a distinction between the terms “listed” and “labeled” which are often used interchangeably. The TG includes Keith Lofland and Donny Cook as co-chairs; John Kovacik, Jim Dollard, Christine Porter, Allan Manche, Vince Della Croce, Brian Rock, George Straniero, and Julian Burns. As the TG worked, Bill Fiske, Joeph Wages, and Bill Lawrence also participated. After many discussions and consideration of numerous recommendations, it seemed clear the TG agreed that an informative annex could provide the greatest value to NEC users. On behalf of the TG, a draft of annex material is submitted. Time and complexity prevents me from indicating submitted material represents the entire TG. The process will determine if the annex provides value and also determine exact content for the NEC.

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Informative Annex XX Equipment Approval

This informational annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

Equipment Approval. NEC 110.2 mandates all conductors and equipment associated with this code be approved. Approved is a defined term. Information provided in this annex can be used to establish a basis for that approval.

Authority Having Jurisdiction (AHJ). Authority having jurisdiction is a defined term and that entity is responsible for approval of all conductors and equipment.

Application. The following NEC definitions and examples are provided to assist with application of the terms as they relate to electrical installations.

Application of Defined Terms

Approved. Acceptable to the authority having jurisdiction.

It is recognized the term “authority having jurisdiction (AHJ) includes a variety of individuals and/or organizations that may be responsible for approval of equipment.

AHJ’s generally establish a basis for approval of conductors and equipment in administrative or policy documents. That written document serves to maintain a clear and consistent approach to approval of products used and connected to electrical installations.

The term *approved*, as defined in Article 100 and required or permitted in Section 110.2, applies to acceptance by the authority having jurisdiction of all materials, equipment, and services. Therefore, this term shall be used in this sense, but only in this sense. On the other hand, materials, equipment, and services that have been listed are not inherently approved by the authority having jurisdiction in general or necessarily deemed by the authority having jurisdiction as suitable for the specific purpose, function, use, environment, or application.

In some cases, the AHJ (Insurance Company) may perform product evaluation and approval. See following example.

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.

Some electrical equipment is manufactured but not listed. Some reasons that condition exist include: specific product standards are not available, limited production with unique characteristics make listing difficult; the NEC does not require listing of the specific product; a collection of parts is assembled by a company not typically defined as a manufacturer; and many other reasons. Where those products are delivered to an electrical installation with no evidence the product complies with an applicable product standard, an AHJ may accept a field evaluation by an approved third party. The subsequent field evaluation, field evaluation marking, and associated report may be used for approval.

The following product is an assembly of products assembled offsite and field evaluated as a basis for approval.

Power Equipment Center–South			
Assembly Manufacturer		PowerSecure Inc.	
Assembly Serial #		16–160010DD–ALP–PECS	
Assembly Switchgear Ratings		Equipment Detail	
Voltage	480Y/277	HP Rating	240/120V
Current	4000A	HP XFRMR kVA	75
Frequency (Hz)	60	HP Panel	400A
Phase	3	HP–ATS Manf.	ASC0300 Series
Wire	4	ATS Rating	200A 480V
SCCR	100KAIC	ATS Disconnect	200A 2P
UL Class	891	Accessibility	Rear
SE Rated	Yes	GFCI Equipment	120 VAC
Accessibility	Front/Rear	Smoke Detection	Yes
Control Power	24VDC/120VAC	External XFRMR	480/277VAC

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.

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

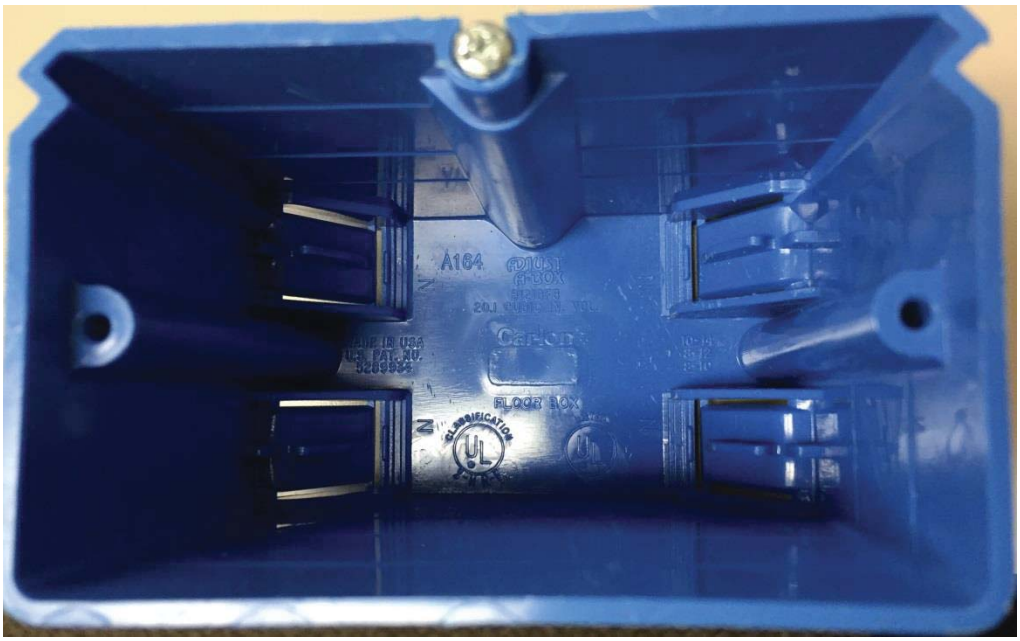
(listing and labeling), an inspection agency, or other organizations concerned with product evaluation.

Equipment may be identified for use in specific environmental conditions such as an outdoor wet location. That identification may or may not be part of the third party certification of the product.

> The term *identified*, as defined in Article 100, applies to materials, equipment, or services being deemed as suitable for a specific purpose, function, use, environment, or application. Therefore, this term shall be used in this sense, but only in this sense. On the other hand, any visual indications on materials or equipment for reasons other than expressing suitability for a specific purpose, function, use, environment, or application shall not be specified or referred to as being "identified".

The following example is a product identified for use in an outdoor wet environment:

The following example is a product that is not identified for use in an outdoor wet environment, but identified for use in a 1 hour fire resistant wall and identified for use as a floor box:

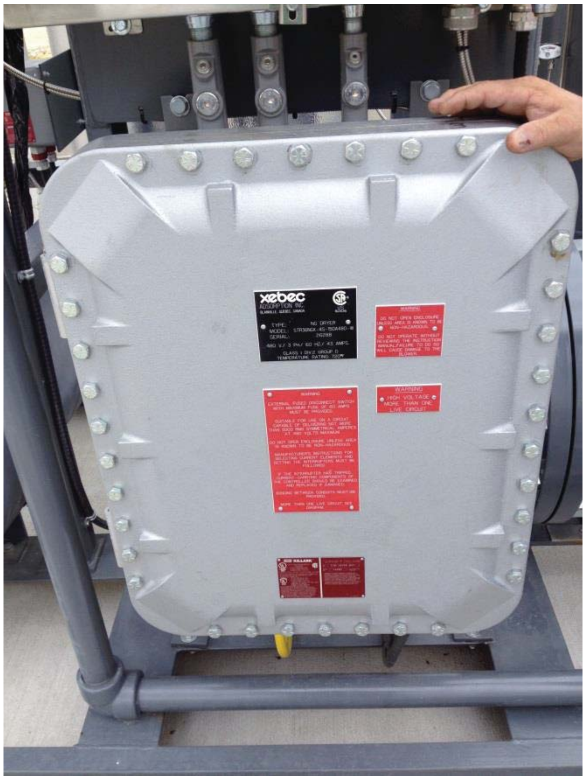


Labeled. Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and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

Some electrical equipment is manufactured and listed by an organization concerned with product evaluations, maintains periodic inspection of production of equipment, and also labeled as evidence the product complies with the appropriate product standard. Where that product is not damaged or altered, an AHJ may use that label as the basis for approval. It should be noted that all labeled equipment is also listed, but not all listed equipment is labeled. It should also be noted that listed or labeled equipment may not be approved if altered or damaged prior to or during installation.

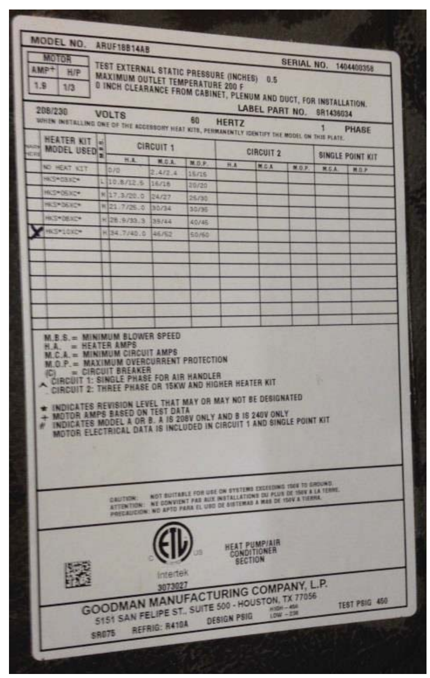
> The term *labeled*, as defined in Article 100, applies to materials, equipment, or services that have been listed or field evaluated by a recognized and accredited certification body acceptable to the authority having jurisdiction and that bear some permanent, physical evidence of that certification accompanying that specific production lot of material or equipment or accompanying that specific serviced installation. Therefore, this term shall be used in this sense, but only in this sense. The evidence of listing or field evaluation is not necessarily in the form of an affixed or adhesive label, but the evidence method is publicly declared by the certification body in a manner accessible to the authority having jurisdiction. On the other hand, whether in the form of an affixed or adhesive label or not, equipment or material required or permitted to bear a visible indication, cautionary notification, or other marking for purposes unrelated to being listed or field evaluated shall not be specified or referred to as being "labeled".

The following examples are products that are listed and labeled.




xebec
ADSORPTION INC.
BLAINVILLE, QUEBEC, CANADA
US
162636
TYPE: NG DRYER
MODEL: STR36NGX-4S-150A480-W
SERIAL: 26288
480 V./ 3 PH./ 60 HZ./ 43 AMPS.
CLASS I DIV.2 GROUP D
TEMPERATURE RATING: 720°F


1HR FIRE WALL


MODEL NO. ARUF18B14AB
SERIAL NO. 1404400358
MOTOR
AMP+ H/P
1.9 1/3
TEST EXTERNAL STATIC PRESSURE (INCHES) 0.5
MAXIMUM OUTLET TEMPERATURE 200 F
0 INCH CLEARANCE FROM CABINET, PLENUM AND DUCT, FOR INSTALLATION.
LABEL PART NO. 9R1436034
208/230 VOLTS
60 HERTZ
1 PHASE
WHEN INSTALLING ONE OF THE ACCESSORY HEAT KITS, PERMANENTLY IDENTIFY THE MODEL ON THIS PLATE.
HEATER KIT MODEL USED
CIRCUIT 1
CIRCUIT 2
SINGLE POINT KIT
H.A.
M.C.A.
M.O.P.
NO HEAT KIT 0/0 2.4/2.4 15/15
HKS*03XC* L 10.8/12.5 16/18 20/20
HKS*05XC* M 17.3/20.0 24/27 25/30
HKS*06XC* M 21.7/25.0 30/34 30/35
HKS*08XC* H 28.9/33.3 39/44 40/45
HKS*10XC* H 34.7/40.0 46/52 50/60
M.B.S. = MINIMUM BLOWER SPEED
H.A. = HEATER AMPS
M.C.A. = MINIMUM CIRCUIT AMPS
M.O.P. = MAXIMUM OVERCURRENT PROTECTION
(C) = CIRCUIT BREAKER
CIRCUIT 1: SINGLE PHASE FOR AIR HANDLER
CIRCUIT 2: THREE PHASE OR 15KW AND HIGHER HEATER KIT
INDICATES REVISION LEVEL THAT MAY OR MAY NOT BE DESIGNATED
MOTOR AMPS BASED ON TEST DATA
INDICATES MODEL A OR B. A IS 208V ONLY AND B IS 240V ONLY
MOTOR ELECTRICAL DATA IS INCLUDED IN CIRCUIT 1 AND SINGLE POINT KIT
HEAT PUMP/AIR CONDITIONER SECTION
Intertek
3073027
GOODMAN MANUFACTURING COMPANY, L.P.
5151 SAN FELIPE ST., SUITE 500 - HOUSTON, TX 77056
SR075 REFRIG: R410A DESIGN PSIG
TEST PSIG 450

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.
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.

Some electrical equipment is manufactured and listed by an organization concerned with product evaluations, maintains periodic inspection of production of equipment. Those products may or may not also be labeled as evidence the product complies with the appropriate product standard. Where that product is not damaged or altered, an AHJ may use that listing as the basis for approval. It should be noted that all labeled equipment is also listed, but not all listed equipment is labeled. It should also be noted that listed equipment may not be approved if altered or damaged prior to or during installation. Additionally, listed equipment used outside the parameters of the listing may not be approved.

> The term *listed*, as defined in Article 100, applies to materials, equipment, or services that have been evaluated by a recognized and accredited certification body acceptable to the authority having jurisdiction. Therefore, this term should be used in this sense, but only in this sense. On the other hand, materials, equipment, or services that are tabulated, delineated, or referenced elsewhere within the Code or in other documents for purposes other than their evaluation to appropriate designated standards appropriate to determine their suitability for a specific purpose, function, use, environment, or application ~~shall~~ should not be specified or referred to as being "listed".

The following example is a product that is listed and labeled.

The following example is a product that is listed, but not labeled.

See examples for product category FHIT

Certified is an undefined term used by OSHA and some certification bodies to describe the evaluation of equipment. The term is more inclusive and includes “listing” and “field evaluation”.

Public Input No. 637-NFPA 70-2017 [New Section after J.7.2]

Annex K: Engineering Ethics from National Society of Professional Engineers

Preamble

Engineering is an important and learned profession. As members of this profession, engineers are expected to exhibit the highest standards of honesty and integrity. Engineering has a direct and vital impact on the quality of life for all people. Accordingly, the services provided by engineers require honesty, impartiality, fairness, and equity, and must be dedicated to the protection of the public health, safety, and welfare. Engineers must perform under a standard of professional behavior that requires adherence to the highest principles of ethical conduct.

I. Fundamental Canons

Engineers, in the fulfillment of their professional duties, shall:

1. Hold paramount the safety, health, and welfare of the public.
2. Perform services only in areas of their competence.
3. Issue public statements only in an objective and truthful manner.
4. Act for each employer or client as faithful agents or trustees.
5. Avoid deceptive acts.
6. Conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession.

II. Rules of Practice

1. Engineers shall hold paramount the safety, health, and welfare of the public.
    a. If engineers' judgment is overruled under circumstances that endanger life or property, they shall notify their employer or client and such other authority as may be appropriate.
    b. Engineers shall approve only those engineering documents that are in conformity with applicable standards.
    c. Engineers shall not reveal facts, data, or information without the prior consent of the client or employer except as authorized or required by law or this Code.
    d. Engineers shall not permit the use of their name or associate in business ventures with any person or firm that they believe is engaged in fraudulent or dishonest enterprise.
    e. Engineers shall not aid or abet the unlawful practice of engineering by a person or firm.
    f. Engineers having knowledge of any alleged violation of this Code shall report thereon to appropriate professional bodies and, when relevant, also to public authorities, and cooperate with the proper authorities in furnishing such information or assistance as may be required.

2. Engineers shall perform services only in the areas of their competence.
    a. Engineers shall undertake assignments only when qualified by education or experience in the specific technical fields involved.

b. Engineers shall not affix their signatures to any plans or documents dealing with subject matter in which they lack competence, nor to any plan or document not prepared under their direction and control.

c. Engineers may accept assignments and assume responsibility for coordination of an entire project and sign and seal the engineering documents for the entire project, provided that each technical segment is signed and sealed only by the qualified engineers who prepared the segment.

3. Engineers shall issue public statements only in an objective and truthful manner.

a. Engineers shall be objective and truthful in professional reports, statements, or testimony. They shall include all relevant and pertinent information in such reports, statements, or testimony, which should bear the date indicating when it was current.

b. Engineers may express publicly technical opinions that are founded upon knowledge of the facts and competence in the subject matter.

c. Engineers shall issue no statements, criticisms, or arguments on technical matters that are inspired or paid for by interested parties, unless they have prefaced their comments by explicitly identifying the interested parties on whose behalf they are speaking, and by revealing the existence of any interest the engineers may have in the matters.

4. Engineers shall act for each employer or client as faithful agents or trustees.

a. Engineers shall disclose all known or potential conflicts of interest that could influence or appear to influence their judgment or the quality of their services.

b. Engineers shall not accept compensation, financial or otherwise, from more than one party for services on the same project, or for services pertaining to the same project, unless the circumstances are fully disclosed and agreed to by all interested parties.

c. Engineers shall not solicit or accept financial or other valuable consideration, directly or indirectly, from outside agents in connection with the work for which they are responsible.

d. Engineers in public service as members, advisors, or employees of a governmental or quasi-governmental body or department shall not participate in decisions with respect to services solicited or provided by them or their organizations in private or public engineering practice.

e. Engineers shall not solicit or accept a contract from a governmental body on which a principal or officer of their organization serves as a member.

5. Engineers shall avoid deceptive acts.

a. Engineers shall not falsify their qualifications or permit misrepresentation of their or their associates' qualifications. They shall not misrepresent or exaggerate their responsibility in or for the subject matter of prior assignments. Brochures or other presentations incident to the solicitation of employment shall not misrepresent pertinent facts concerning employers, employees, associates, joint venturers, or past accomplishments.

b. Engineers shall not offer, give, solicit, or receive, either directly or indirectly, any contribution to influence the award of a contract by public authority, or which may be reasonably construed by the public as having the effect or intent of influencing the awarding of a contract. They shall not offer any gift or other valuable consideration in order to secure work. They shall not pay a commission, percentage, or brokerage fee in order to secure work, except to a bona fide employee or bona fide established commercial or marketing agencies retained by them.

III. Professional Obligations

1. Engineers shall be guided in all their relations by the highest standards of honesty and integrity.
    a. Engineers shall acknowledge their errors and shall not distort or alter the facts.
    b. Engineers shall advise their clients or employers when they believe a project will not be successful.
    c. Engineers shall not accept outside employment to the detriment of their regular work or interest. Before accepting any outside engineering employment, they will notify their employers.
    d. Engineers shall not attempt to attract an engineer from another employer by false or misleading pretenses.
    e. Engineers shall not promote their own interest at the expense of the dignity and integrity of the profession.

2. Engineers shall at all times strive to serve the public interest.
    a. Engineers are encouraged to participate in civic affairs; career guidance for youths; and work for the advancement of the safety, health, and well-being of their community.
    b. Engineers shall not complete, sign, or seal plans and/or specifications that are not in conformity with applicable engineering standards. If the client or employer insists on such unprofessional conduct, they shall notify the proper authorities and withdraw from further service on the project.
    c. Engineers are encouraged to extend public knowledge and appreciation of engineering and its achievements.
    d. Engineers are encouraged to adhere to the principles of sustainable development [1] in order to protect the environment for future generations.

3. Engineers shall avoid all conduct or practice that deceives the public.
    a. Engineers shall avoid the use of statements containing a material misrepresentation of fact or omitting a material fact.
    b. Consistent with the foregoing, engineers may advertise for recruitment of personnel.
    c. Consistent with the foregoing, engineers may prepare articles for the lay or technical press, but such articles shall not imply credit to the author for work performed by others.

4. Engineers shall not disclose, without consent, confidential information concerning the business affairs or technical processes of any present or former client or employer, or public body on which they serve.
    a. Engineers shall not, without the consent of all interested parties, promote or arrange for new employment or practice in connection with a specific project for which the engineer has gained particular and specialized knowledge.
    b. Engineers shall not, without the consent of all interested parties, participate in or represent an adversary interest in connection with a specific project or proceeding in which the engineer has gained particular specialized knowledge on behalf of a former client or employer.

5. Engineers shall not be influenced in their professional duties by conflicting interests.
    a. Engineers shall not accept financial or other considerations, including free engineering designs,

from material or equipment suppliers for specifying their product.

b. Engineers shall not accept commissions or allowances, directly or indirectly, from contractors or other parties dealing with clients or employers of the engineer in connection with work for which the engineer is responsible.

6. Engineers shall not attempt to obtain employment or advancement or professional engagements by untruthfully criticizing other engineers, or by other improper or questionable methods.
    a. Engineers shall not request, propose, or accept a commission on a contingent basis under circumstances in which their judgment may be compromised.
    b. Engineers in salaried positions shall accept part-time engineering work only to the extent consistent with policies of the employer and in accordance with ethical considerations.
    c. Engineers shall not, without consent, use equipment, supplies, laboratory, or office facilities of an employer to carry on outside private practice.

7. Engineers shall not attempt to injure, maliciously or falsely, directly or indirectly, the professional reputation, prospects, practice, or employment of other engineers. Engineers who believe others are guilty of unethical or illegal practice shall present such information to the proper authority for action.
    a. Engineers in private practice shall not review the work of another engineer for the same client, except with the knowledge of such engineer, or unless the connection of such engineer with the work has been terminated.
    b. Engineers in governmental, industrial, or educational employ are entitled to review and evaluate the work of other engineers when so required by their employment duties.
    c. Engineers in sales or industrial employ are entitled to make engineering comparisons of represented products with products of other suppliers.

8. Engineers shall accept personal responsibility for their professional activities, provided, however, that engineers may seek indemnification for services arising out of their practice for other than gross negligence, where the engineer's interests cannot otherwise be protected.
    a. Engineers shall conform with state registration laws in the practice of engineering.
    b. Engineers shall not use association with a nonengineer, a corporation, or partnership as a "cloak" for unethical acts.

9. Engineers shall give credit for engineering work to those to whom credit is due, and will recognize the proprietary interests of others.
    a. Engineers shall, whenever possible, name the person or persons who may be individually responsible for designs, inventions, writings, or other accomplishments.
    b. Engineers using designs supplied by a client recognize that the designs remain the property of the client and may not be duplicated by the engineer for others without express permission.
    c. Engineers, before undertaking work for others in connection with which the engineer may make improvements, plans, designs, inventions, or other records that may justify copyrights or patents, should enter into a positive agreement regarding ownership.
    d. Engineers' designs, data, records, and notes referring exclusively to an employer's work are the employer's property. The employer should indemnify the engineer for use of the information for any purpose other than the original purpose.

e. Engineers shall continue their professional development throughout their careers and should keep current in their specialty fields by engaging in professional practice, participating in continuing education courses, reading in the technical literature, and attending professional meetings and seminars.

Footnote 1 "Sustainable development" is the challenge of meeting human needs for natural resources, industrial products, energy, food, transportation, shelter, and effective waste management while conserving and protecting environmental quality and the natural resource base essential for future development.

As Revised July 2007

By order of the United States District Court for the District of Columbia, former Section 11(c) of the NSPE Code of Ethics prohibiting competitive bidding, and all policy statements, opinions, rulings or other guidelines interpreting its scope, have been rescinded as unlawfully interfering with the legal right of engineers, protected under the antitrust laws, to provide price information to prospective clients; accordingly, nothing contained in the NSPE Code of Ethics, policy statements, opinions, rulings or other guidelines prohibits the submission of price quotations or competitive bids for engineering services at any time or in any amount.

Statement by NSPE Executive Committee

In order to correct misunderstandings which have been indicated in some instances since the issuance of the Supreme Court decision and the entry of the Final Judgment, it is noted that in its decision of April 25, 1978, the Supreme Court of the United States declared: "The Sherman Act does not require competitive bidding."

It is further noted that as made clear in the Supreme Court decision:

1. Engineers and firms may individually refuse to bid for engineering services.
2. Clients are not required to seek bids for engineering services.
3. Federal, state, and local laws governing procedures to procure engineering services are not affected, and remain in full force and effect.
4. State societies and local chapters are free to actively and aggressively seek legislation for professional selection and negotiation procedures by public agencies.
5. State registration board rules of professional conduct, including rules prohibiting competitive bidding for engineering services, are not affected and remain in full force and effect. State registration boards with authority to adopt rules of professional conduct may adopt rules governing procedures to obtain engineering services.
6. As noted by the Supreme Court, "nothing in the judgment prevents NSPE and its members from attempting to influence governmental action . . ."

NOTE : In regard to the question of application of the Code to corporations vis-à-vis real persons, business form or type should not negate nor influence conformance of individuals to the Code. The Code deals with professional services, which services must be performed by real persons. Real persons in turn establish and implement policies within business structures. The Code is clearly written to apply to the Engineer, and it is incumbent on members of NSPE to endeavor to live up to its provisions. This applies to all pertinent sections of the Code.

Statement of Problem and Substantiation for Public Input

By including the Engineering Ethics as an annex of the NEC, it holds paramount the importance of upholding to this code of ethics in an electrical design. Compliance with the NEC is intertwined with designing and installing in an ethical manner.

Submitter Information Verification

Submitter Full Name: Matt Fann
Organization: DWG Consulting Engineers Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Tue May 02 11:40:42 EDT 2017

Copyright Assignment

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Origin (from sources other than the submitter)

National Society of Professional Engineers