Code-Making Panel 13

Public Input Report (A19)

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.

Submitter Information Verification

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

Public Input No. 1073-NFPA 70-2017 [Global Input]

Change all written percentages to numerical percentages.

Statement of Problem and Substantiation for Public Input

To standardize how percentages are represented in the NEC

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 1071-NFPA 70-2017 [Section No. 690.8(B)(1)]	
Public Input No. 1070-NFPA 70-2017 [Section No. 690.8(B)(1)]	

Submitter Information Verification

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Submittal Date: Sat Jun 24 16:11:26 EDT 2017

Public Input No. 3180-NFPA 70-2017 [Global Input]

ANSI/UL 2196, Standard for Tests of Fire-Resistive Cable is referenced in multiple places in the NEC. A new edition of the standard (2017) has been published with a title change.

Please replace all of the references to UL 2196 in the NEC (except for Annex A) with the following.

***"ANSI/UL 2196. Standard for Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables*, 2017 edition"**

References to UL 2196 in Annex A will be handled in a separate PI.

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. 3189-NFPA 70-2017 [Annex A]	Title change to UL 2196

Submitter Information Verification

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Submittal Date: Sun Sep 03 10:00:20 EDT 2017

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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Submittal Date: Wed Sep 06 10:12:45 EDT 2017

Copyright Assignment

I, Agnieszka Golriz, 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 Agnieszka Golriz, 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. 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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Submittal Date:	Thu Sep 07 20:19:11 EDT 2017

Copyright Assignment

I, Thomas Domitrovich, 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 Thomas Domitrovich, 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. 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

Submitter Full Name: Tom Pernal

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Submittal Date: Sat May 20 15:35:20 EDT 2017

Public Input No. 2485-NFPA 70-2017 [Chapter 7 [Title Only]]

Special ~~Conditions~~ Circuits and Systems

Statement of Problem and Substantiation for Public Input

this title describes the following articles better as they are not all conditions.

Submitter Information Verification

Submitter Full Name: Alfio Torrisi
Organization: Master electrician
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Submittal Date: Sat Aug 19 16:05:32 EDT 2017

Public Input No. 3306-NFPA 70-2017 [Definition: Electric Power Production and Distribution Netw...]

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~~ are connected to premises wiring , that are external to and not controlled by an interactive system. (CMP-13)

Additional Proposed Changes

File Name	Description	Approved
PV_Industry_Forum.pdf		✓

Statement of Problem and Substantiation for Public Input

Correction of duplicated definition. Also, there may be connected equipment and wiring that does not constitute a “load”, so that term is replaced with premises wiring.

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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Zip:
Submittal Date: Tue Sep 05 12:05:08 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:

<u>Coordinating committee:</u>
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

<u>Conveners:</u>
Mark Baldassari, Enphase Energy
Ward Bower, Ward Bower Innovations
Bill Brooks, PVICC
Dave Click, ESA Renewables
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Task Group Members (alphabetical last name):

Hasib Amin, SunPower
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Charlie Dearie, McCalmont Engineering
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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
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Ryan Stankevitz, Sensata
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Laura Walters, SEI
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Dave White, Bentek
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Sean White, Sean White
John Wiles, John Wiles
Rob Wills, Intergrid
Benjamin Wong, SunPower
Steve Wozniak, First Solar
Tim Zgonena, UL

Public Input No. 3521-NFPA 70-2017 [Definition: Interactive Inverter.]

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~~ 4)

Statement of Problem and Substantiation for Public Input

This is editorial. CMP 4 covers the majority of code language and issues related to interactive inverters.

This PI was developed by the PV Industry Forum (PVIF). For a description of the PVIF, please see PI-3306

Submitter Information Verification

Submitter Full Name:	Philip Undercuffler
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State:	
Zip:	
Submittal Date:	Wed Sep 06 12:29:08 EDT 2017

Public Input No. 4176-NFPA 70-2017 [Definition: Interactive Inverter.]

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~~ 4)

Statement of Problem and Substantiation for Public Input

This definინition relates mainly to NEC 705 which is under CMP4 (Editorial)

Submitter Information Verification

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Submittal Date:	Thu Sep 07 15:54:23 EDT 2017

Public Input No. 4316-NFPA 70-2017 [Definition: Interactive Inverter.]

Interactive Inverter.

An inverter intended for use in parallel ~~with~~ with another electric power production source, such as an electric utility , to supply common loads that may deliver power to the ~~utility~~ other power production source or energy storage . (CMP-13)

Statement of Problem and Substantiation for Public Input

Interactive inverters can be interactive with any appropriate ac source, not just sources generated by a public utility. Since these inverters are used in many different applications, including in stand-alone systems, this definition should not be exclusive to only a utility source. It is important that non-interactive inverters not be installed in systems that require the safety features inherent to listed interactive inverter-based sources.This change also better aligns this definition with the use of this term in other articles, including in article 705, and better matches the definition of an interactive system in article 100.

Submitter Information Verification

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Submittal Date: Thu Sep 07 20:17:37 EDT 2017

Public Input No. 3400-NFPA 70-2017 [Part I.]

Part I. General

Prime Mover. The mechanical means of turning a generator's rotor.

Statement of Problem and Substantiation for Public Input

Because “prime mover” is a specialized term, requiring specific mechanical knowledge to understand it’s meaning, I am proposing that the definition is added as new text. I believe that it will help add clarity to the NEC in the way that definitions of specific terms can.

Section 2.2.2.1 of the NEC style manual states that Article 100 shall contain definitions of terms that appear in two or more other articles of the NEC. With that being said, the term “Prime Mover” appears in Articles: 445.18 title and 445.18 (B), 700.12 (B)(1), 701.12 (B)(1). No definition is provided in any of these Articles.

Submitter Information Verification

Submitter Full Name: Richard Janoski

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Submittal Date: Tue Sep 05 19:01:22 EDT 2017

Public Input No. 4035-NFPA 70-2017 [Section No. 445.1]

445.1 Scope.

This article contains installation and other requirements for generators above 15-kw or where connected to, or intended to be connected to the bulding power supply system .

Statement of Problem and Substantiation for Public Input

Portable Generators below 15-kw that are used for general field temporary use and not connected to or intended to be connected to a building power system have really no ability to be inspected or looked at for any code compliance as they are not part of any building system falling under the scope of 90.2. Many times these generators are used for camping or are in the back of a van to be used for power via extension cord and are not used in any way as part of premises wiring and are not called upon to be inspected or have a permit issued by a AHJ for their use. Even is used in an emergency and power into a building they are still not connected to premises wiring and no one is going to ask for a permit in a storm. IF connected via a docking station or power inlet they then should be covered and the proposed change to the scope addresses that.

Submitter Information Verification

Submitter Full Name: Steven Froemming

Organization: City of Franklin

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Submittal Date: Thu Sep 07 12:44:28 EDT 2017

Public Input No. 3956-NFPA 70-2017 [New Section after 445.10]

TITLE OF NEW CONTENT

445.5 Equipment. The generator equipment and its accessories shall be listed and rated for the electrical and environmental application of use.

Statement of Problem and Substantiation for Public Input

Substantiation – STATIONARY ENGINE GENERATOR ASSEMBLIES - UL 2200, is the UL ANSI standard for engine generators and it addresses safety concerns for both the electrical and fuel control for electrical generating equipment. Engine generators need to operate safely under normal and foreseeable abnormal conditions to prevent a risk of electric shock, fire and mechanical hazards especially considering they are often exposed to general public access in residential, commercial and industrial applications.
Dozens of manufactures have certified hundreds of generator models in accordance with UL2200 since it was published in 1998 and it is now being expanded through the ANSI consensus process to address the needs of both the USA and Canada. The expanded UL/ULC2200 standard additionally includes requirements for medium voltage generators as well as relocatable trailer mounted generators. These generators may be driven by gasoline, LP-gas, natural gas, diesel or bio fueled internal combustion engines. Additionally UL2200 certified engine generator assemblies are intended for installation and use in ordinary locations in accordance with the National Electrical Code NFPA 70; the Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines, NFPA 37, the Standard for Health Care Facilities, NFPA 99, and the Standard for Emergency and Standby Power Systems, NFPA 110. UL2200 includes numerous NEC references and requirements to facilitate a Code compliant engine generator electrical installation.

Submitter Information Verification

Submitter Full Name: Timothy Zgonena
Organization: UL LLC
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Submittal Date: Thu Sep 07 10:25:18 EDT 2017

Public Input No. 12-NFPA 70-2017 [New Article after 445]

445.6 Listing Requirements.

Permanently installed generators shall be listed and labeled for the condictions of use.

Statement of Problem and Substantiation for Public Input

The 2015 ICC International Fuel Gas Code in Section 616, Engine and Gas Turbine-Powered Equipment has the following code requirement. 616.1 Powered Equipment. Permanently installed equipment powered by internal combustion engines and turbines shall be installed in accordance with the manufacturer's installation instructions and NFPA 37. Stationary engine generator assemblies shall meet the requirements of UL 2200.

The 2015 ICC International Building Code in Section 2702.1.1 requires all emergency and legally required standby generators to be UL listed. The IBC and IFGC are commonly adopted standards throughout the United States and its territories and these standards require generators to meet the requirements of the UL 2200 Standard for Stationary Engine Generator Assemblies. The ICC listing requirements should also be included in Article 445, as this Code Article has purview over generators and should require the same listing requirements for all permanently installed emergency, legally required, and optional standby system generators.

Submitter Information Verification

Submitter Full Name: Brian Baughman
Organization: Generac Power Systems Inc
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City:
State:
Zip:
Submittal Date: Fri Jan 20 14:40:25 EST 2017

Public Input No. 246-NFPA 70-2017 [New Section after 445.1]

TITLE OF NEW CONTENT

410.6 Listing

Generators shall be listed and labled

Exceptions, Generator that are proprietary, experimental or manufactered prior to the adoption of this requirement

Statement of Problem and Substantiation for Public Input

for safety reasons equipment should be listed so the inspector can rely on this identification for acceptance.and placment of the generator

Submitter Information Verification

Submitter Full Name: Alfio Torrisi

Organization: master electricain

Street Address:

City:

State:

Zip:

Submittal Date: Thu Feb 16 07:42:05 EST 2017

Public Input No. 245-NFPA 70-2017 [Section No. 445.10]

445.~~10~~ 3 Location.

Generators shall ~~be of a type suitable for the locations in which they are installed. They shall~~ also meet the requirements for motors in 430.14.

> Informational Note: See NFPA 37, *Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines*, for information on the location of generator exhaust.

Statement of Problem and Substantiation for Public Input

the deleted text is a 110.3 B requirement, and this section references article 430 according to the manual style this information should be in .3

Submitter Information Verification

Submitter Full Name: Alfio Torrisi
Organization: Master electrician
Street Address:
City:
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Zip:
Submittal Date: Thu Feb 16 07:38:52 EST 2017

Public Input No. 3-NFPA 70-2017 [Section No. 445.10]

445.10 Location.

Generators shall be of a type suitable for the locations in which they are installed. ~~They shall also meet the requirements for motors in~~ ~~430.14~~ Generators shall be situated so that they are readily accessible for maintenance, repair, and fire fighting. Access and working space shall be provided and maintained in accordance with Parts II or III of Articel 110 around open generator sets. Where the generator set is equipped with an enclosure, access and working space shall be provided and maintained in accordance with Parts II or III of Article 110 at any accessible cover, panel or door of the generator enclosure .

Informational Note: See NFPA 37, *Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines*, for information on the location of generator ~~exhaust~~ sets .

Statement of Problem and Substantiation for Public Input

NFPA 37, Section 4.1.1.1 requires that an engine be situated so that they are readily accessible for maintenance, repair, or fire fighting. A generator set is also electrical equipment that may have to serviced, adjusted, examined, or maintained while operating and producing electrical power, and for this reason adequate working space should be provided to servicing personal based on the nominal operating voltage of the generator set. Additionally 445.18 requires that the generator be equipped with a readily accessible disconnecting means, by requiring a clear working space, emergency personal will have ready access to the generator disconnecting means.

Submitter Information Verification

Submitter Full Name: Brian Baughman

Organization: Generac Power Systems Inc

Street Address:

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Zip:

Submittal Date: Fri Jan 20 10:21:11 EST 2017

Public Input No. 497-NFPA 70-2017 [Section No. 445.10]

445.10 Location.

A. Generators shall be of a type suitable for the locations in which they are installed. They shall also meet the requirements for motors in 430.14.

B. Portable generators shall be positioned at least 20 feet outside of any open window, door or vent where exhaust can vent into an enclosed area.

Informational Note: See NFPA 37, *Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines*, for information on the location of generator exhaust.

Statement of Problem and Substantiation for Public Input

The current standard addresses installation requirements of stationary generators. This proposal is to add location requirements for portable generators. The CDC has made recommendations to keep portable generators at least 20 feet away from an enclosed area to prevent Carbon Monoxide from entering in sufficient concentrations to cause injury or death.

Submitter Information Verification

Submitter Full Name:	George Brandon
Organization:	One World Technologies
Affilliation:	One World Technologies: Manufacture of consumer portable generators.
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Fri Apr 07 09:22:20 EDT 2017

Public Input No. 1256-NFPA 70-2017 [Section No. 445.11]

445.11 Marking.

Each generator shall be provided with a nameplate giving the manufacturer's name, the rated frequency, the number of phases if ac, the rating in kilowatts or kilovolt-amperes, the power factor, the normal volts and amperes corresponding to the rating, the rated ambient temperature, and the rated temperature rise.

Nameplates or manufacturer's instructions shall provide the following information for all stationary generators and portable generators rated more than 15 kW:

(1) Subtransient, transient, synchronous, and zero sequence reactances

(2) Power rating category

(3) Insulation system class

(4) Indication if the generator is protected against overload by inherent design, an overcurrent protective relay, circuit breaker, or fuse

(5) ~~Maximum short-circuit~~ Available fault current for inverter-based generators, in lieu of the synchronous, subtransient, and transient reactances

Marking shall be provided by the manufacturer to indicate whether or not the generator neutral is bonded to its frame. Where the bonding is modified in the field, additional marking shall be required to indicate whether the neutral is bonded to the frame.

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. 1249-NFPA 70-2017 [Section No. 110.24(A)]	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. 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

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Public Input No. 2056-NFPA 70-2017 [Section No. 445.11]

445.11 Marking.

Each generator shall be provided with a nameplate giving the manufacturer's name, the rated frequency, the number of phases if ac, the rating in kilowatts or kilovolt-amperes, the power factor, the normal volts and amperes corresponding to the rating, the rated ambient temperature, and either the rated temperature rise or the insulation system class .

Nameplates or manufacturer's instructions shall provide the following information for all stationary generators and portable generators rated more than 15 kW:

(1) Subtransient, transient, synchronous, and zero sequence reactances

(2) Power rating category

(3) Insulation system class

(4) Indication if the generator is protected against overload by inherent design, an overcurrent protective relay, circuit breaker, or fuse

(5) Maximum short-circuit current for inverter-based generators, in lieu of the synchronous, subtransient, and transient reactances

Marking shall be provided by the manufacturer to indicate whether or not the generator neutral is bonded to its frame. Where the bonding is modified in the field, additional marking shall be required to indicate whether the neutral is bonded to the frame.

Statement of Problem and Substantiation for Public Input

The meaning of "rated temperature rise" is not clear to portable generator manufacturers. It would be preferable to allow an option to mark the insulation system class rating (e.g. Class F or Class H) in order to fulfill this requirement. Insulation system class rating is well understood by portable generator manufacturers.

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Public Input No. 3731-NFPA 70-2017 [Section No. 445.11]

445.11

(A) Marking .

Each generator shall be provided with a nameplate giving the manufacturer's name, the rated frequency, the number of phases if ac, the rating in kilowatts or kilovolt-amperes, the power factor, the normal volts and amperes corresponding to the rating, the rated ambient temperature, and the rated temperature rise.

Nameplates or manufacturer's instructions shall provide the following information for all stationary generators and portable generators rated more than 15 kW:

(1) Subtransient, transient, synchronous, and zero sequence reactances

(2) Power rating category

(3) Insulation system class

(4) Indication if the generator is protected against overload by inherent design, an overcurrent protective relay, circuit breaker, or fuse

(5) Maximum short-circuit current for inverter-based generators, in lieu of the synchronous, subtransient, and transient reactances

Marking shall be provided by the manufacturer to indicate whether or not the generator neutral is bonded to its frame. Where the bonding is modified in the field, additional marking shall be required to indicate whether the neutral is bonded to the frame.

(B) Identification of Power Sources.

Generator systems shall be indicated by 445.11(B)(1) and (2).

(1) Facilities with Utility Services and Generators. Plaques or directories shall be installed in accordance with 705.10 and 712.10(A).

(2) Facilities with Stand-Alone Systems. Plaques or directories shall be installed in accordance with 710.10.

Statement of Problem and Substantiation for Public Input

This public input addresses ongoing concerns expressed by the fire service and other first responders on the need to secure on-site power sources during emergencies and awareness of where those sources are. Effective means of securing utility sources have long been established by local fire departments however there is a lack of uniform procedures in how to effectively secure on-site power sources that may be at a premises due to the variety of different source types, the rapid rate of product adoption, and varied or absent Code language addressing notice on the location of specific sources. This proposed change is part of a grouping of proposals that will correlate various sections of the NEC and consistently require this important marking be located outside a building regardless of whether the utility service equipment is located indoors or outdoors. This will provide warnings to first responders about the presence and location of on-site power sources prior to entering a building.

Since generator systems may be connected to interactive systems, stand-alone systems, or both, and may connect to other equipment with either AC or DC outputs, this new proposed language directs users to other articles that are appropriate for the specific application. By avoiding specific requirements and simply pointing to appropriate other articles and sections, this change will also remove the chance of deviations that could otherwise develop in marking requirements between different sources.

This input has been developed and is supported by Tesla, who manufactures and installs both PV and energy storage equipment as well as Robert J. Davidson of Davidson Code Concepts. LLC. Complementary language is also being submitted by this team to fire and building Codes as appropriate in an attempt to harmonize these requirements across all relevant Codes.

Related Public Inputs for This Document

Related Input	Relationship

Public Input No. 3561-NFPA 70-2017 [Section No. 705.10]	Related text for interconnected ac source applications
Public Input No. 3599-NFPA 70-2017 [New Section after 710.6]	Related text for stand-alone system applications
Public Input No. 3601-NFPA 70-2017 [Section No. 712.10]	Related text for dc microgrid system applications
Public Input No. 3702-NFPA 70-2017 [Section No. 706.11]	Addresses on-site ESS sources
Public Input No. 3713-NFPA 70-2017 [Section No. 690.56(A)]	Addresses on-site PV sources in Stand-alone systems
Public Input No. 3717-NFPA 70-2017 [Section No. 690.56(B)]	Addresses on-site PV sources in utility interactive systems
Public Input No. 3724-NFPA 70-2017 [Section No. 690.56(C)(1)]	Addresses PV rapid shutdown placarding requirements
Public Input No. 3729-NFPA 70-2017 [New Section after 480.7(D)]	Addresses on-site battery sources
Public Input No. 3735-NFPA 70-2017 [Section No. 694.22(C)(2)]	Addresses marking of on-site wind generator disconnects with placards.
Public Input No. 3736-NFPA 70-2017 [Section No. 694.54]	Addresses on-site wind generator sources
Public Input No. 3746-NFPA 70-2017 [Section No. 692.4(B)]	Addresses on-site fuel cell sources

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Public Input No. 1-NFPA 70-2017 [Section No. 445.13]

445.13 Ampacity of Generator Feeder Conductors.

(A)

~~General.~~

~~The~~

Overcurrent Protection Not Provided.

Where the generator set is not equipped with listed overcurrent protection, or a combination of a current transformer and overcurrent relay, the ampacity of the conductors from the generator

~~output~~

field wiring terminals to the ~~first distribution~~ generator overcurrent protection device(s) ~~containing overcurrent protection shall~~ required by 445.12 shall not be less than 115 percent of the nameplate current rating of the generator. It shall be permitted to size the neutral conductors in accordance with 220.61. Conductors that must carry ground-fault currents shall not be smaller than required by 250.~~30(A)~~ 35 . Neutral conductors of dc generators that must carry ground-fault currents shall not be smaller than the minimum required size of the largest conductor.

~~Exception: Where the design and operation of the generator prevent overloading, the ampacity of the conductors shall not be less than 100 percent of the nameplate current rating of the generator~~

The overcurrent protection for the generator feeder conductors shall be installed in accordance with the manufacturers installation instructions .

(B) Overcurrent Protection Provided.

Where the generator set is equipped with a listed overcurrent protective device in accordance wih 445.12 or a combination of a current transformer and overcurrent relay, the ampacity of the conductors from the gnerator field wiring terminals shall not less than 100%25 of the nameplate current rating of the generator. It shall be permissible to size the neutral conductors in accordance to 220.61. Conductors that must carry ground fault currents shall not be sized smaller than required by 250.35. Neutral conductors of dc generators that must carry ground fault currents shall not be smaller than the minimum size of the largest conductor. Feeder conductors shall be permitted to be tapped from the load side of the protected generator field wiring terminals in accordance with 240.21(B).

Tapped conductors shall not be permitted for portable generators rated 15 kW or less where field wiring connection terminals are not accessible.

Statement of Problem and Substantiation for Public Input

Overcurrent protection is not required by UL to be included within the generator set. When this is the case the generator feeder conductors are to be sized to 115% of the nameplate rating because these conductors can be overloaded before the OCPD opens and clears the condition . When the generator does not have integral overcurrent protection and is installed as a nonseparately derived system 250.35(B) requires a supply side bonding jumper be installed to carry any fault currents. The proposed change adds clarity on how to size generator feeder conductors when the generator is not provided with over current protection.

Many generators manufactured today are designed with listed internal overcurrent protection. The generator controller generally provides the protection and can be listed as such. Category Code FTPM- Controls of Stationary Engine Driven Assemblies in the UL White Book and Product Spec states that these controllers may additionally perform other secondary functions, such as battery charging, generator voltage regulation, power factor adjustment, overload protection, short circuit interruption, GFCI protection, and many other types of protection. Since these controllers will shut the generator down on an overload alarm, the feeder conductors are also protected from overload and should be allowed to be sized to 100% of the nameplate current rating of the generator. The old exception to 445.13 (A) was incorporated into the new proposed language to 445.13(B) because to only way for the design and operation of the generator to prevent overloading is to have overcurrent protection provided within the generator set.

The change to 250.35 brings clarity that the generator may be installed as a separately or nonseparately derived system, whereas 250.30(A) only covers separately derived systems.

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Public Input No. 3957-NFPA 70-2017 [Section No. 445.14]

445.14 Protection of Live Parts.

Live parts of generators operated at more than ~~50 volts~~ 30 volts ac or 60 volts dc ~~to ground~~ in dry locations and 15 volts ac or 30 volts dc in wet locations shall not be exposed to accidental contact where accessible to unqualified persons.

Statement of Problem and Substantiation for Public Input

Substantiation - these limits are aligned with the requirements in the STATIONARY ENGINE GENERATOR ASSEMBLIES - UL 2200, Table 9.1 Risk of electric shock – maximum voltage as well as other similar applications such as NEC 411.1 for low-voltage lighting accessible circuits in wet and dry locations.

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Public Input No. 3471-NFPA 70-2017 [Section No. 445.18]

445.18 Disconnecting Means ~~and Shutdown of~~ and Emergency Stopping of Prime Mover.

(A) Disconnecting Means.

Generators other than cord-and-plug-connected portable shall have one or more disconnecting means. Each disconnecting means shall simultaneously open all associated ungrounded conductors. Each disconnecting means shall be lockable in the open position in accordance with 110.25.

(B) ~~Shutdown of~~ Emergency Stopping of Prime Mover.

Generators shall have ~~provisions to shut down~~ provisions for emergency stopping the prime mover. ~~The means of shutdown shall~~ The emergency stopping means shall comply with all of the following:

(1) Be equipped with provisions to disable all prime mover start control circuits to render the prime mover incapable of starting

(2) Initiate a shutdown mechanism that requires a mechanical reset

The ~~provisions to shut down the~~ provisions for emergency stopping the prime mover shall be permitted to satisfy the requirements of 445.18(A) where it is capable of being locked in the open position in accordance with 110.25.

Generators with greater than 15 kW rating shall be provided with an ~~additional requirement to shut down the~~ additional means for emergency stopping the prime mover. ~~This additional shutdown means~~ The additional means shall be located outside the equipment room or generator enclosure and shall also meet the requirements of 445.18(B)(1) and (B)(2).

(C) Generators Installed in Parallel.

Where a generator is installed in parallel with other generators, the provisions of 445.18(A) shall be capable of isolating the generator output terminals from the paralleling equipment. The disconnecting means shall not be required to be located at the generator.

Statement of Problem and Substantiation for Public Input

Use of the phrase “Shutdown of Prime Mover” in title (and article) of 445.18(B) is somewhat confusing and inconsistent with industry terminology and related codes and standards.

We should be calling it “Emergency Stopping of Prime Mover”. ISO 8528-13 (Safety Standard for Generating Sets) and NFPA 110 (2019 draft) both refer to this function as "Emergency Stop".

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Public Input No. 1576-NFPA 70-2017 [Section No. 445.18(A)]

(A) Disconnecting Means.

Generators other than cord-and-plug-connected portable shall have one or more disconnecting means. Each disconnecting means shall simultaneously open all associated ungrounded conductors. Each disconnecting means shall be lockable ~~in the~~ open ~~position~~ in accordance with 110.25.

Statement of Problem and Substantiation for Public Input

Aligns the text with 110.25

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Public Input No. 3945-NFPA 70-2017 [Section No. 445.18(A)]

(A) Disconnecting Means.

Generators other than cord-and-plug-connected portable shall have one or more disconnecting means. Each disconnecting means shall simultaneously open all associated ungrounded conductors. Each disconnecting means shall be lockable in the open position in accordance with 110.25. <u>It shall be permitted to allow 445.18 (B) as the required disconnecting mean.</u>

Statement of Problem and Substantiation for Public Input

in the pass you were allowed to use one or the other, this would make it clear either a disconnect or a shut down of the prime mover will comply.

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Public Input No. 3772-NFPA 70-2017 [Section No. 445.18(B)]

(B) Shutdown of Prime Mover.

Generators shall have provisions to shut down the prime mover. The means of shutdown shall comply with all of the following:

(1) Be equipped with provisions to disable all prime mover start control circuits to render the prime mover incapable of starting

(2) Initiate a shutdown mechanism that requires a mechanical reset

The provisions to shut down the prime mover shall be permitted to satisfy the requirements of 445.18(A) where it is capable of being locked in the open position in accordance with 110.25.

Generators with greater than 15 kW rating shall be provided with an additional requirement to shut down the prime mover. This additional shutdown means shall be located outside the equipment room or generator enclosure and shall also meet the requirements of 445.18(B)(1) and (B)(2). <u>For one-family and two-family dwellings, provisions to shut down the prime mover shall be located at a readily accessible location outside the building.</u>

Statement of Problem and Substantiation for Public Input

This public input addresses ongoing concerns expressed by the fire service and other first responders on the need to secure on-site power sources during emergencies and awareness of where those sources are. Effective means of securing utility sources have long been established by local fire departments however there is a lack of uniform procedures in how to effectively secure on-site power sources that may be at a premises due to the variety of different source types, the rapid rate of product adoption, and varied or absent Code language addressing notice and disconnection location of specific sources.

This proposed change is part of a grouping of proposals that will correlate various sections of the NEC and consistently require this important on-site source disconnecting switch to be located outside a one or two family dwelling regardless of whether the utility service equipment is located indoors or outdoors. This disconnecting switch will be marked on the warning placards also required to be located outdoors (see other PIs from this submitter) and will allow first responders to secure this on-site source prior to entering the building. Through our other PIs we propose a requirement that placards or directories showing the location of these switch(es) be located outdoors and grouped however we only propose requiring that the switch be readily accessible and located outdoors, without a specific requirement that it be grouped with other source disconnect switches. This is for practical purposes, especially when considering existing conditions. This should provide ready access by first responders to secure these sources prior to entering the dwelling since their outdoor location will be clearly marked on the required placards. This requirement as proposed is limited to one and two family dwellings since these buildings present unique challenges to fire departments. This proposed requirement has also been limited in this proposal to the existing shutdown requirements for generators above 15kW in rating.

This input has been developed and is supported by Tesla, who manufactures and installs both PV and energy storage equipment as well as Robert J. Davidson of Davidson Code Concepts. LLC. Complementary language is also being submitted by this team to fire and building Codes as appropriate in an attempt to harmonize these requirements across all relevant Codes.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3760-NFPA 70-2017 [Section No. 706.7(A)]	Requirements for external disconnects for ESS in 1&2 family dwellings
Public Input No. 3770-NFPA 70-2017 [Section No. 480.7(A)]	Requirements for external disconnects for batteries in 1&2 family dwellings
Public Input No. 3780-NFPA 70-2017 [Section No. 694.22(C)(1)]	Requirements for external disconnects for wind generators in 1&2 family dwellings
Public Input No. 3783-NFPA 70-2017 [Section No. 692.13]	Requirements for external disconnects for fuel cells in 1&2 family dwellings

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Public Input No. 4195-NFPA 70-2017 [Section No. 445.18(B)]

(B) Shutdown of Prime Mover.

Generators, other than cord-and-plug-connected portable, shall have provisions to shut down the prime mover. The means of shutdown shall comply with all of the following:

(1) Be equipped with provisions to disable all prime mover start control circuits to render the prime mover incapable of starting

(2) Initiate a shutdown mechanism that requires a mechanical reset. Engine controller pushbuttons are acceptable.

The provisions to shut down the prime mover shall be permitted to satisfy the requirements of 445.18(A) where it is capable of being locked in the open position in accordance with 110.25.

Generators with greater than 15 kW rating shall be provided with an additional ~~requirement to~~ shut down ~~the prime mover~~ means . This additional shutdown means shall be located outside the equipment room or generator enclosure and shall also meet the requirements of 445.18(B)(1) and (B)(2).

Exception: Generators installed on one and two family dwelling units shall not require the additional shutdown means.

Statement of Problem and Substantiation for Public Input

The addition of the text ", other than cord-and-plug-connected portable," will harmonize 445.18(B) with 445.18(A) and provide clarity to this clause.

The addition of the text "Engine controller pushbuttons are acceptable." will provide clarity to this clause. The controller STOP button initiates a sequence that at a minimum performs the functions required in 445.18(B)(1) and (2). The generator industry has accepted this method as a reliable means of shutdown. A "reset" is accomplished by the fact that the act of removing the finger from the button does not change the state of the function. A different button has to be pressed to perform a different function.

The changes to the 3rd paragraph clarifies what additionally has to provided.

Adding the exception allows for generators small in physical size to avoid the burden of an additional shutdown on the outside of the enclosure.
It is just as easy to use the shutdown provided on the unit to perform this function. If 2 shutdowns are provided they end up within inches of each other due to the small physical size of the overall unit.

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Public Input No. 5-NFPA 70-2017 [Section No. 445.18(B)]

(B) Shutdown of Prime Mover.

Generators, other than cord and plug connected protable shall have provisions to shut down the prime mover. The means of shutdown shall comply with all of the following:

(1) Be equipped with provisions to disable all prime mover start control circuits to render the prime mover incapable of starting

(2) Initiate a shutdown mechanism that requires a mechanical reset

The provisions to shut down the prime mover shall be permitted to satisfy the requirements of 445.18(A) where it is capable of being locked in the open position in accordance with 110.25.

Generators with greater than 15 kW rating shall be provided with an additional requirement to shut down the prime mover. This additional shutdown means shall be located outside the equipment room or generator enclosure and shall also meet the requirements of 445.18(B)(1) and (B)(2)

Exception: On one and two family dwelling units where the generator is equipped with an external provision to shut down the prime mover on the generator enclosure, a readily accessible manual fuel shut off valve shalll be permitted to serve as the additional shutdown means for the prime mover for generators with a greater than 15 kW rating . The manual fuel shut off valve shall be located within 6 feet of the generator.

Statement of Problem and Substantiation for Public Input

The 2017 language in 445.18 required 2 means of shutdown for the prime mover for any generator 15 kW or larger. It is a common installation practice to install 16-22 kW air-cooled fuel gas fired generators on one or two family dwelling units. Both the NFPA 54 and the ICC IFGC require that a manual fuel shut off valve be installed within 6 feet of these generators to shut off the fuel supply to the appliance. The proposed exception would allow these manual fuel shut off valves to serve as the additional means of shutdown if the generator enclosure was equipped with a shut down device on the exterior of the generator enclosure that shuts the generator down and prevents the prime mover from starting or running. The requirements of 445.18(A) do not apply to cord and plug connected portable generators and the same considerations should apply the the prime mover shut down requirement in 445.18(B).

Submitter Information Verification

Submitter Full Name: Brian Baughman

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Submittal Date: Fri Jan 20 10:45:48 EST 2017

Public Input No. 2896-NFPA 70-2017 [Section No. 445.20]

445.20 Ground-Fault Circuit-Interrupter Protection for Receptacles on 15-kW or Smaller Portable Generators.

~~Unbonded generators with both 125-volt and 125/250-volt receptacle outlets shall have listed GFCI protection for personnel integral to the generator or receptacle on~~

~~Receptacle outlets that are a part of a 15-kW or smaller portable generator shall have listed~~ Listed ground-fault circuit-interrupter protection (GFCI) for personnel ~~integral to the generator or receptacle as indicated in either (A) or (B):~~

~~**(A)** Unbonded (Floating Neutral) Generators.~~

shall be provided for all 125-volt, 15- and 20-ampere

~~receptacle outlets.Exception~~

receptacles if the neutral conductor is bonded to the frame of the generator as required by 250.34(C).

Exception No. 1 : GFCI protection shall not be required

~~where~~

if the 125-volt receptacle

~~outlets~~

(s) is interlocked such that it is not available for use when any 125/250-volt receptacle(s) is in use.

~~**(B)** Bonded Neutral Generators.~~

~~Bonded generators shall be provided with GFCI protection on all 125-volt, 15- and 20-ampere receptacle outlets~~

Exception No 2: If the generator was manufactured or remanufactured prior to January 1, 2015, listed cord sets or devices incorporating listed GFCI protection for personnel identified for portable use shall be permitted rather than providing GFCI protection of the receptacle .

Informational Note: Refer

~~to~~

to 590.6(A)(3)

~~for~~

for GFCI requirements for 15-kW or smaller portable generators used for temporary electric power and lighting.

~~*Exception to (A) and (B): If the generator was manufactured or remanufactured prior to January 1, 2015, listed cord sets or devices incorporating listed GFCI protection for personnel identified for portable use shall be permitted.*~~

Additional Proposed Changes

File Name	Description	Approved
445-20_GFCI.jpg	Portable Generator with Unbonded (Floating) Neutral	
445.20.docx	Word file showing changes.	✓

Statement of Problem and Substantiation for Public Input

The section is reworded to clarify that GFCI protection is not required if the generator has a floating neutral.
The UL Standard for Ground-Fault Circuit-Interrupters, UL-943 as repeated in KCXS of UL's ProductSpec database states "GFCIs are intended to be used only in circuits where one of the conductors is solidly grounded." This connection ensures that a path exists for ground-fault current to be sensed by the GFCI circuitry. Since no such path exists for a portable generator with a floating neutral, a GFCI device cannot function to provide the intended personnel

protection. Installing a GFCI device on a portable generator is a violation of the UL Standard. In addition, its very presence can send a false and misleading message to the user of the portable generator that GFCI protection is provided when in fact that protection is not functional.

While a portable generator is not required to have a grounding electrode connection due to the nature of the generator being portable, a path or circuit for ground-fault current is provided when the grounded (white) conductor is bonded to the generator frame.

See the attached drawing for a graphic representation of a GFCI device that is installed on a portable generator with a floating neutral.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2824-NFPA 70-2017 [Section No. 250.34(C)]	

Submitter Information Verification

Submitter Full Name: Phil Simmons

Organization: Simmons Electrical Services

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Submittal Date: Mon Aug 28 18:12:02 EDT 2017

Public Input No. 2896-NFPA 70-2017 [Section No. 445.20]

445.20 Ground-Fault Circuit-Interrupter Protection for Receptacles on 15-kW or Smaller Portable Generators.

~~Unbonded generators with both 125-volt and 125/250-volt receptacle outlets shall have listed GFCI protection for personnel integral to the generator or receptacle on~~

~~Receptacle outlets that are a part of a 15-kW or smaller portable generator shall have listed~~ Listed ground-fault circuit-interrupter protection (GFCI) for personnel ~~integral to the generator or receptacle as indicated in either (A) or (B): (A) Unbonded (Floating Neutral) Generators.~~ shall be provided for all 125-volt, 15- and 20-ampere ~~receptacle outlets~~ receptacles if the neutral conductor is bonded to the frame of the generator as required by 250.34(C).

Exception No. 1: GFCI protection shall not be required ~~where~~ *if the 125-volt receptacle* ~~outlets~~ *(s) is interlocked such that it is not available for use when any 125/250-volt receptacle(s) is in use.*

~~(B) Bonded Neutral Generators.~~

~~Bonded generators shall be provided with GFCI protection on all 125-volt, 15- and 20-ampere receptacle outlets~~

Exception No 2: If the generator was manufactured or remanufactured prior to January 1, 2015, listed cord sets or devices incorporating listed GFCI protection for personnel identified for portable use shall be permitted rather than providing GFCI protection of the receptacle.

Informational Note: Refer to 590.6(A)(3) ~~for~~ *for GFCI requirements for 15-kW or smaller portable generators used for temporary electric power and lighting.*

~~*Exception to (A) and (B): If the generator was manufactured or remanufactured prior to January 1, 2015, listed cord sets or devices incorporating listed GFCI protection for personnel identified for portable use shall be permitted.*~~

Statement of Problem and Substantiation for Public Input

The section is reworded to clarify that GFCI protection is not required if the generator has a floating neutral. The UL Standard for Ground-Fault Circuit-Interrupters, UL-943 as repeated in KCXS of UL's ProductSpec database states "GFCIs are intended to be used only in circuits where one of the conductors is solidly grounded." This connection ensures that a path exists for ground-fault current to be sensed by the GFCI circuitry. Since no such path exists for a portable generator with a floating neutral, a GFCI device cannot function to provide the intended personnel protection. Installing a GFCI device on a portable generator is a violation of the UL Standard. In addition, its very presence can send a false and misleading message to the user of the portable generator that GFCI protection is provided when in fact that protection is not functional. While a portable generator is not required to have a grounding electrode connection due to the nature of the generator being portable, a path or circuit for ground-fault current is provided when the grounded (white) conductor is bonded to the generator frame. See the attached drawing for a graphic representation of a GFCI device that is installed on a portable generator with a floating neutral.

Submitter Information Verification

Submitter Full Name: Phil Simmons

Organization: Simmons Electrical Services

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Copyright Assignment

I, Phil Simmons, 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 Phil Simmons, 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. 6-NFPA 70-2017 [Section No. 445.20]

445.20 Ground-Fault Circuit-Interrupter Protection for Receptacles on ~~15-kW or Smaller~~ Portable Generators.

Receptacle

outlets that are a part of a ~~15-kW or smaller~~ portable

generator shall

have

listed

ground-fault circuit-interrupter protection

(GFCI)

for personnel integral to the <u>protable</u> generator ~~or receptacle~~

~~as indicated in either (A) or (B):~~

~~**(A)** Unbonded (Floating Neutral) Generators.~~

~~Unbonded generators with both 125-volt and 125/250-volt receptacle outlets shall have listed GFCI protection for personnel integral to the generator or receptacle on all 125-volt, 15- and 20-ampere receptacle outlets.~~

~~*Exception: GFCI protection shall not be required where the 125-volt receptacle outlets(s) is interlocked such that it is not available for use when any 125/250-volt receptacle(s) is in use.*~~

~~**(B)** Bonded Neutral Generators.~~

~~Bonded generators shall be provided with GFCI protection on all 125-volt, 15- and 20-ampere receptacle outlets.~~

~~Informational Note: Refer to~~

<u>in accordnace with</u> <u>590.6(A)(3)</u>

~~for GFCI requirements for 15-kW or smaller portable generators used for temporary electric power and lighting.Exception to (A) and (B)~~

<u>Exception No 1</u> : If the generator was manufactured or remanufactured prior to January 1, 2015, listed cord sets or devices incorporating listed GFCI protection for personnel identified for portable use shall be permitted.

<u>Exception No 2: Where a protable generator is connected to a premise wiring system in accordnace with the requirements in Article 702, the 30- and/or 50-ampere 125/250- volt, single phase receptacles shall not be required to have ground-fault circuit-interrupter protection.</u>

Statement of Problem and Substantiation for Public Input

In the 2010 revision cycle, CMP 3 laid out the requirements for GFCI receptacle on portable generators. CMP 13 should not have been given purview over temporary power requirements and the 2017 language to 445.20 did not correlate to 590.6(A)(3) and should of been removed from the NEC. The use of any size portable generator for any purpose is a temporary installation, and the requirements in Article 590 have purview as it applies to GFCI protection on portable generators. The proposed language brings clarity that 590.6(A)(3) states the NFPA requirements for these type of GFCI receptacles.

The new exception will not require the 30 or 50A receptacle to have GFCI protection when the generator is connected to a premise wiring system as an optional standby. The branch circuits within the premise wiring system will have GFCI protection where required by Article 210, so there is no need for the portable generator feeder conductors to be GFCI protected as well.

250.34(C) does not allow a portable generator to operate under a floating neutral condition and the 2017 NEC text in

445.20(A) has language that can be interpreted as allowing an unsafe condition. CMP 5 has purview over the grounding and bonding of portable generators.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 7-NFPA 70-2017 [Section No. 590.6(A)(3)]	Both Article cover GFCI requirements for portable generators and should correlate with each other

Submitter Information Verification

Submitter Full Name: Brian Baughman

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City:

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Submittal Date: Fri Jan 20 11:34:25 EST 2017

Public Input No. 2239-NFPA 70-2017 [Section No. 455.2]

455.2 Definitions.

~~**Manufactured Phase.**~~

~~The manufactured or derived phase originates at the phase converter and is not solidly connected to either of the single-phase input conductors~~

(A) Application Within this Article and throughout the Code. The following definition shall apply within this article and throughout the code .

Phase Converter.

An electrical device that converts single-phase power to 3-phase electric power.

> Informational Note: Phase converters have characteristics that modify the starting torque and locked-rotor current of motors served, and consideration is required in selecting a phase converter for a specific load.

(B) Application Within this Article. The following definitions shall apply only within this article.

Manufactured Phase.

The manufactured or derived phase originates at the phase converter and is not solidly connected to either of the single-phase input conductors.

Rotary-Phase Converter.

A device that consists of a rotary transformer and capacitor panel(s) that permits the operation of 3-phase loads from a single-phase supply.

Static-Phase Converter.

A device without rotating parts, sized for a given 3-phase load to permit operation from a single-phase supply.

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

Related Public Inputs for This Document

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

Submitter Information Verification

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Submittal Date:	Tue Aug 15 13:20:39 EDT 2017

Public Input No. 696-NFPA 70-2017 [Section No. 480.10(E)]

(E) Egress.

A personnel door(s) intended for entrance to, and egress from, rooms designated as battery rooms shall open in the direction of egress and shall 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 battery rooms are required to be enclosed with fire rated construction which required fire rated doors. See NFPA 111 for some rooms that require a fire rating.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 692-NFPA 70-2017 [Section No. 110.26(C)(3)]	Same Condition
Public Input No. 693-NFPA 70-2017 [Section No. 110.31(A)(4)]	Same Condition
Public Input No. 694-NFPA 70-2017 [Section No. 110.33(A)(3)]	Same Condition
Public Input No. 695-NFPA 70-2017 [Section No. 450.43(C)]	Similar Condition

Submitter Information Verification

Submitter Full Name: Matt Ruhrer
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Submittal Date: Fri May 12 15:22:59 EDT 2017

Public Input No. 1220-NFPA 70-2017 [Section No. 480.2]

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

Cell.

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

Container.

A vessel that holds the plates, electrolyte, and other elements of a single unit in a battery.

Informational Note: A container may be single-cell or multi-cell and is sometimes referred to in the industry as a “jar.”

Electrolyte.

The medium that provides the ion transport mechanism between the positive and negative electrodes of a cell.

Intercell Connector.

An electrically conductive bar or cable used to connect adjacent cells.

Intertier Connector.

An electrical conductor used to connect two cells on different tiers of the same rack or different shelves of the same rack.

Nominal Voltage (Battery or Cell).

The value assigned to a cell or battery of a given voltage class for the purpose of convenient designation. The operating voltage of the cell or battery may vary above or below this value.

Informational Note: The most common nominal cell voltages are 2 volts per cell for the lead-acid systems, 1.2 volts per cell for alkali systems, and 3.6 to 3.8 volts per cell for Li-ion systems. Nominal voltages might vary with different chemistries.

Sealed Cell or Battery.

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

Storage Battery.

A battery comprised of one or more rechargeable cells of the lead-acid, nickel-cadmium, or other rechargeable electrochemical types.

Terminal.

That part of a cell, container, or battery to which an external connection is made (commonly identified as post, pillar, pole, or terminal post).

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

Related Public Inputs for This Document

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

Submitter Information Verification

Submitter Full Name: James Dollard
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Submittal Date: Fri Jul 21 14:10:08 EDT 2017

Public Input No. 2950-NFPA 70-2017 [Section No. 480.2]

480.2 Definitions.

Battery.

Two or more cells connected together electrically in series, in parallel, or a combination of both to provide the required operating voltage and current levels.

Cell.

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

Container.

A vessel that holds the plates, electrolyte, and other elements of a single unit in a battery.

Informational Note: A container may be single-cell or multi-cell and is sometimes referred to in the industry as a “jar.”

Electrolyte.

The medium that provides the ion transport mechanism between the positive and negative electrodes of a cell.

Intercell Connector.

An electrically conductive bar or cable used to connect adjacent cells.

Intertier Connector.

An electrical conductor used to connect two cells on different tiers of the same rack or different shelves of the same rack.

Nominal Voltage (Battery or Cell).

The value assigned to a cell or battery of a given voltage class for the purpose of convenient designation. The operating voltage of the cell or battery may vary above or below this value.

Informational Note: The most common nominal cell voltages are 2 volts per cell for the lead-acid systems, 1.2 volts per cell for alkali systems, and 3.6 to 3.8 volts per cell for Li-ion systems. Nominal voltages might vary with different chemistries.

Sealed Cell or Battery.

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

Storage Battery.

A battery comprised of one or more rechargeable cells of the lead-acid, nickel-cadmium, or other rechargeable electrochemical types.

Terminal.

That part of a cell, container, or battery to which an external connection is made (commonly identified as post, pillar, pole, or terminal post).

Statement of Problem and Substantiation for Public Input

This public input is the result of an Energy Storage Task Group that was put together by CMP 13 to correlate Article 706, Energy Storage Systems and Article 480, Batteries. There are redundant requirements between both articles. To improve the clarity and usability of the NEC document the task group was charged to remove redundant requirements, move any requirements for batteries out of Article 706 and into Article 480, and to better define an Energy Storage System. The Task Group members were Larry Ayer, Jim Dollard, Dan Neeser, Mario Spina, Tim Croushore, Bill Cantor, Chad Kennedy, Steve Froemming, John Kovacik and Dan Caron.

This public input relocates the definition of Battery into Article 480. The companion public input 2981 deletes the definition in 706.2.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2981-NFPA 70-2017 [Section No. 706.2]	Deletes Definition of Battery
Public Input No. 2952-NFPA 70-2017 [New Section after 480.4(C)]	
Public Input No. 2953-NFPA 70-2017 [Section No. 480.7]	
Public Input No. 2955-NFPA 70-2017 [New Section after 480.10]	
Public Input No. 2957-NFPA 70-2017 [Section No. 706.1]	
Public Input No. 2959-NFPA 70-2017 [Section No. 706.7]	
Public Input No. 2961-NFPA 70-2017 [Section No. 706.10]	
Public Input No. 2987-NFPA 70-2017 [Definition: Energy Storage System (ESS).]	
Public Input No. 2989-NFPA 70-2017 [Sections Part III., 706.30, 706.31, 706.32, 706.33, 706.34]	
Public Input No. 3413-NFPA 70-2017 [Section No. 706.7(D)]	
Public Input No. 3415-NFPA 70-2017 [Section No. 706.4]	
Public Input No. 3661-NFPA 70-2017 [Section No. 706.7]	

Submitter Information Verification

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Submittal Date: Tue Aug 29 15:29:12 EDT 2017

Public Input No. 2952-NFPA 70-2017 [New Section after 480.4(C)]

(D) Accessibility.

The terminals of all cells or multi-cell units shall be readily accessible for readings, inspections and cleaning where required by the equipment design. One side of transparent battery containers shall be readily accessible for inspections of the internal components.

Statement of Problem and Substantiation for Public Input

This public input is the result of an Energy Storage Task Group that was put together by CMP 13 to correlate Article 706, Energy Storage Systems and Article 480, Batteries. There are redundant requirements between both articles. To improve the clarity and usability of the NEC document the task group was charged to remove redundant requirements, move any requirements for batteries out of Article 706 and into Article 480, and to better define an Energy Storage System. The Task Group members were Larry Ayer, Jim Dollard, Dan Neeser, Mario Spina, Tim Croushore, Bill Cantor, Chad Kennedy, Steve Froemming, John Kovacik and Dan Caron

This public input relocates 706.33 Accessibility from Article 706 and to 480.4(D) since it deals strictly with Batteries. The companion public input 2989 deletes section 706.33.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2989-NFPA 70-2017 [Sections Part III., 706.30, 706.31, 706.32, 706.33, 706.34]	Deletes section 706.33

Submitter Information Verification

Submitter Full Name: Lawrence Ayer

Organization: Biz Com Electric Inc

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Submittal Date: Tue Aug 29 15:46:14 EDT 2017

Public Input No. 2953-NFPA 70-2017 [Section No. 480.7]

Part II. Battery Installation

480.7 DC Disconnect Methods.

(A) Disconnecting Means.

A disconnecting means shall be provided for all ungrounded conductors derived from a stationary battery system with a voltage over 60 volts dc. A disconnecting means shall be readily accessible and located within sight of the battery system.

Informational Note: See 240.21(H) for information on the location of the overcurrent device for battery conductors.

(B) – Disconnection of Series Battery Circuits.

Battery circuits subject to field servicing, where exceeding 240 volts nominal between conductors or to ground, shall have provisions to disconnect the series-connected strings into segments not exceeding 240 volts nominal for maintenance by qualified persons. Non–load-break bolted or plug-in disconnects shall be permitted.

(C) Remote Actuation.

Where a disconnecting means, located in accordance with 480.7(A), is provided with remote controls to activate the disconnecting means and the controls for the disconnecting means are not located within sight of the stationary battery system, the disconnecting means shall be capable of being locked in the open position, in accordance with 110.25, and the location of the controls shall be field marked on the disconnecting means.

(~~C~~ D) – Busway.

Where a DC busway system is installed, the disconnecting means shall be permitted to be incorporated into the busway.

(~~D~~ E) – Notification.

The disconnecting means shall be legibly marked in the field. A label with the marking shall be placed in a conspicuous location near the battery if a disconnecting means is not provided. The marking shall be of sufficient durability to withstand the environment involved and shall include the following:

(1) Nominal battery voltage

(2) Maximum available short-circuit current derived from the stationary battery system

(3) Date the short-circuit current calculation was performed

(4) The battery disconnecting means shall be marked in accordance with 110.16.

Informational Note No. 1: Battery equipment suppliers can provide information about short-circuit current on any particular battery model.

Informational Note No. 2: The available short-circuit current marking(s) addressed in 480.7(D)(2) 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

This public input is the result of an Energy Storage Task Group that was put together by CMP 13 to correlate Article 706, Energy Storage Systems and Article 480, Batteries. There was redundant requirements between both articles. To improve the clarity and usability of the NEC document the task group was charged to remove redundant requirements, move any requirements for batteries out of Article 706 and into Article 480, and to better define an Energy Storage System. The Task Group members were Larry Ayer, Jim Dollard, Dan Neeser, Mario Spina, Tim Croushore, Bill Cantor, Chad Kennedy, Steve Froemming, John Kovacik and Dan Caron

This public input relocates 706.30(B) to 480.7(B) since it deals strictly with batteries. A companion public input 2989 deletes 706.30(B).

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2989-NFPA 70-2017 [Sections Part III., 706.30, 706.31, 706.32, 706.33, 706.34]	Deletes 706.30(B)

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Public Input No. 3770-NFPA 70-2017 [Section No. 480.7(A)]

(A) Disconnecting Means.

A disconnecting means shall be provided for all ungrounded conductors derived from a stationary battery system with a voltage over 60 volts dc. A disconnecting means shall be readily accessible and located within sight of the battery system.

For one-family and two-family dwellings, a disconnecting means or its remote control shall be located at a readily accessible location outside the building.

Informational Note: See 240.21(H) for information on the location of the overcurrent device for battery conductors.

Statement of Problem and Substantiation for Public Input

This public input addresses ongoing concerns expressed by the fire service and other first responders on the need to secure on-site power sources during emergencies and awareness of where those sources are. Effective means of securing utility sources have long been established by local fire departments however there is a lack of uniform procedures in how to effectively secure on-site power sources that may be at a premises due to the variety of different source types, the rapid rate of product adoption, and varied or absent Code language addressing notice and disconnection location of specific sources.

This proposed change is part of a grouping of proposals that will correlate various sections of the NEC and consistently require this important on-site source disconnecting switch to be located outside a one or two family dwelling regardless of whether the utility service equipment is located indoors or outdoors. This disconnecting switch will be marked on the warning placards also required to be located outdoors (see other PIs from this submitter) and will allow first responders to secure this on-site source prior to entering the building. Through our other PIs we propose a requirement that placards or directories showing the location of these switch(es) be located outdoors and grouped however we only propose requiring that the switch be readily accessible and located outdoors, without a specific requirement that it be grouped with other source disconnect switches. This is for practical purposes, especially when considering existing conditions. This should provide ready access by first responders to secure these sources prior to entering the dwelling since their outdoor location will be clearly marked on the required placards. This requirement as proposed is limited to one and two family dwellings since these buildings present unique challenges to fire departments.

This input has been developed and is supported by Tesla, who manufactures and installs both PV and energy storage equipment as well as Robert J. Davidson of Davidson Code Concepts. LLC. Complementary language is also being submitted by this team to fire and building Codes as appropriate in an attempt to harmonize these requirements across all relevant Codes.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3760-NFPA 70-2017 [Section No. 706.7(A)]	Requirements for external disconnects for ESS in 1&2 family dwellings
Public Input No. 3772-NFPA 70-2017 [Section No. 445.18(B)]	Requirements for external shutdown means for generators in excess of 15kW in 1&2 family dwellings.
Public Input No. 3780-NFPA 70-2017 [Section No. 694.22(C)(1)]	Requirements for external disconnects for wind generators in 1&2 family dwellings
Public Input No. 3783-NFPA 70-2017 [Section No. 692.13]	Requirements for external disconnects for fuel cells in 1&2 family dwellings

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Copyright Assignment

I, Jason Fisher, 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 Jason Fisher, 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. 1257-NFPA 70-2017 [Section No. 480.7(D)]

(D) Notification.

The disconnecting means shall be legibly marked in the field. A label with the marking shall be placed in a conspicuous location near the battery if a disconnecting means is not provided. The marking shall be of sufficient durability to withstand the environment involved and shall include the following:

(1) Nominal battery voltage

(2) ~~Maximum available short-circuit~~ Available fault current derived from the stationary battery system

(3) Date the ~~short-circuit~~ available fault current calculation was performed

(4) The battery disconnecting means shall be marked in accordance with 110.16.

Informational Note No. 1: Battery equipment suppliers can provide information about ~~short-circuit~~ available fault current on any particular battery model.

Informational Note No. 2: The available ~~short-circuit~~ fault current marking(s) addressed in 480.7(D)(2) 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. 1249-NFPA 70-2017 [Section No. 110.24(A)]	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. 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

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Public Input No. 3729-NFPA 70-2017 [New Section after 480.7(D)]

480.7(E) Identification of Power Sources.

Battery systems shall be indicated by 480.7(E)(1) and (2).

(1) **Facilities with Utility Services and Battery Systems.** Plaques or directories shall be installed in accordance with 705.10 and 712.10(A).

(2) **Facilities with Stand-Alone Systems** . Plaques or directories shall be installed in accordance with 710.10.

Statement of Problem and Substantiation for Public Input

This public input addresses ongoing concerns expressed by the fire service and other first responders on the need to secure on-site power sources during emergencies and awareness of where those sources are. Effective means of securing utility sources have long been established by local fire departments however there is a lack of uniform procedures in how to effectively secure on-site power sources that may be at a premises due to the variety of different source types, the rapid rate of product adoption, and varied or absent Code language addressing notice on the location of specific sources. This proposed change is part of a grouping of proposals that will correlate various sections of the NEC and consistently require this important marking be located outside a building regardless of whether the utility service equipment is located indoors or outdoors. This will provide warnings to first responders about the presence and location of on-site power sources prior to entering a building.
Since battery systems may be connected to interactive systems, stand-alone systems, or both, and may connect to other equipment with either AC or DC outputs, this new proposed language directs users to other articles that are appropriate for the specific application. By avoiding specific requirements and simply pointing to appropriate other articles and sections, this change will also remove the chance of deviations that could otherwise develop in marking requirements between different sources.
This input has been developed and is supported by Tesla, who manufactures and installs both PV and energy storage equipment as well as Robert J. Davidson of Davidson Code Concepts. LLC. Complementary language is also being submitted by this team to fire and building Codes as appropriate in an attempt to harmonize these requirements across all relevant Codes.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3561-NFPA 70-2017 [Section No. 705.10]	Related text for interconnected ac source applications
Public Input No. 3599-NFPA 70-2017 [New Section after 710.6]	Related text for stand-alone system applications
Public Input No. 3601-NFPA 70-2017 [Section No. 712.10]	Related text for dc microgrid system applications
Public Input No. 3702-NFPA 70-2017 [Section No. 706.11]	Addresses on-site ESS sources
Public Input No. 3713-NFPA 70-2017 [Section No. 690.56(A)]	Addresses on-site PV sources in Stand-alone systems
Public Input No. 3717-NFPA 70-2017 [Section No. 690.56(B)]	Addresses on-site PV sources in utility interactive systems
Public Input No. 3724-NFPA 70-2017 [Section No. 690.56(C)(1)]	Addresses PV rapid shutdown placarding requirements
Public Input No. 3731-NFPA 70-2017 [Section No. 445.11]	Addresses on-site generator sources
Public Input No. 3735-NFPA 70-2017 [Section No. 694.22(C)(2)]	Addresses marking of on-site wind generator disconnects with placards.
Public Input No. 3736-NFPA 70-2017 [Section No. 694.54]	Addresses on-site wind generator sources

Public Input No. 3746-NFPA 70-2017 [Section No. 692.4(B)] Addresses on-site fuel cell sources

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Copyright Assignment

Public Input No. 2955-NFPA 70-2017 [New Section after 480.10]

480.11 Battery Interconnections.

Flexible cables, as identified in Article 400, in sizes 2/0 AWG and larger shall be permitted within the battery enclosure from battery terminals to a nearby junction box where they shall be connected to an approved wiring method. Flexible battery cables shall also be permitted between batteries and cells within the battery enclosure. Such cables shall be listed and identified as moisture resistant. Flexible, fine-stranded cables shall only be used with terminals, lugs, devices, or connectors in accordance with 110.14. Type your content here ...

Statement of Problem and Substantiation for Public Input

This public input is the result of an Energy Storage Task Group that was put together by CMP 13 to correlate Article 706, Energy Storage Systems and Article 480, Batteries. There was redundant requirements between both articles. To improve the clarity and usability of the NEC document the task group was charged to remove redundant requirements, move any requirements for batteries out of Article 706 and into Article 480, and to better define an Energy Storage System. The Task Group members were Larry Ayer, Jim Dollard, Dan Neeser, Mario Spina, Tim Croushore, Bill Cantor, Chad Kennedy, Steve Froemming, John Kovacik and Dan Caron.

This public input relocates 706.32 to a new section in Article 480, namely 480.11. Companion public input 2989 deletes 706.32 from Article 706.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2989-NFPA 70-2017 [Sections Part III., 706.30, 706.31, 706.32, 706.33, 706.34]	Deletes 706.32

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Public Input No. 1969-NFPA 70-2017 [Section No. 695.2]

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

Fault-Tolerant External Control Circuits.

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

On-Site Power Production Facility.

The normal supply of electric power for the site that is expected to be constantly producing power.

On-Site Standby Generator.

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

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.

Related Public Inputs for This Document

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

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Public Input No. 871-NFPA 70-2017 [Section No. 695.3(A)(1)]

(1)

~~Electric Utility~~

Service Connection

, the following shall apply:

(a) A fire pump shall be permitted to be supplied by a separate service, or

(b) from a connection located ahead of and not within the same cabinet, enclosure, vertical switchgear section, or vertical switchboard section

~~as~~
of the service disconnecting means.

(c) The connection shall be located and arranged so as to minimize the possibility of damage by fire from within the premises and from exposing hazards. A ~~tap~~ connection ahead of the service disconnecting means shall comply with 230.82(~~5~~ 10).

(d) The service conductors and equipment suppling the fire pump shall comply with the ~~labeling requirements~~ requirments in Article 230. ~~2 and the location requirements in 230.72(B) . [~~ **20:** ~~9.2.2(1)]~~

(e) If the service is a grounded system and supplying a three phase fire pump with no netural load, it shall be permitted to omit the netrual. Bonding of the equipment shall be provided by the requirements in 250.92 and 250.102.

Statement of Problem and Substantiation for Public Input

a Service is a electrical power supplied by the utility, this is in a listed format for easy reading , the no neutral required in the change, is a reflection on what is actually happening in the field electricians supply a three phase load do not pull a neutral. Because it is a grounded service supplying the fire pump it requires a neutral to be installed 250.24 (C), so the language is permissive so you have choice, you would still need proper bonding of the equipment which will be addressed by following article 250.

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Public Input No. 1493-NFPA 70-2017 [Section No. 695.3(B)(2)]

(2) Individual Source and On-site Standby Generator.

An approved combination of one or more of the sources in 695.3(A) and an on-site standby generator complying with 695.3(D). [**20:**9.3.4]

*Exception to (B)(1) and (B)(2): An alternate source of power shall not be required where a back-up engine-driven ~~or~~ , back-up steam turbine-driven ~~fire~~ ,or backup electric motor driven (with independent power source complying with 695.3(A)) fire pump is installed. [**20:**9.3.3]*

Statement of Problem and Substantiation for Public Input

NFPA 20, Section 9.3.3 specifically allows redundant electric driven fire pumps with independent single, approved, power sources in lieu of redundant power sources and an automatic transfer switch. This acknowledgement was not included in the previous revisions to the NEC®.

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Public Input No. 2085-NFPA 70-2017 [Section No. 695.3(C)(3)]

(3) Selective Coordination.

The overcurrent protective device(s) in each disconnecting means shall be selectively coordinated with ~~any other~~ all supply-side overcurrent protective device(s).

Selective coordination shall be selected by a licensed professional engineer or other qualified persons engaged primarily in the design, installation, or maintenance of electrical systems. The selection shall be documented and made available to those authorized to design, install, inspect, maintain, and operate the system.

Exception No. 1: Between transformer primary and secondary overcurrent protective devices, where only one overcurrent protective device or set of overcurrent protective devices exists on the transformer secondary.

Exception No. 2: Between overcurrent protective devices of the same size (ampere rating) in series.

Statement of Problem and Substantiation for Public Input

Other sections of the Code provide more specific requirements and exceptions that define the procedures for achieving Selective Coordination. The proposed revision provides correlation between this section and the other sections of this Code that require selective coordination. In an attempt to achieve consistency between all NEC sections that require selective coordination, similar revisions will be proposed for the following sections:
NEC 620.62
NEC 645.27
NEC 700.32
NEC 701.27
NEC 708.54

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Public Input No. 3190-NFPA 70-2017 [Section No. 695.4(B)(2)]

(2) Overcurrent Device Selection.

Overcurrent devices shall comply with 695.4(B)(2)(a) or (b).

(a) *Individual Sources.* Overcurrent protection for individual sources shall comply with 695.4(B)(2)(a)(1) or (2).

(2) Overcurrent protective device(s) shall be rated to carry indefinitely the sum of the locked-rotor current of the largest fire pump motor and the

~~pressure maintenance pump motor(s) and the~~

(1) full-load current of all of the other pump motors and

~~associated fire pump~~

(1) accessory equipment

~~when connected to this power supply.~~

(1) . [**20:** 9.2.3.4]

(b) Exception No. 1: Where the locked-rotor current value does not correspond to a standard overcurrent device size, the next standard overcurrent device size shall be used in accordance with 240.6 . Exception No. 2: The requirement to carry the locked-rotor

~~currents indefinitely~~

(a) currentsindefinitely shall not apply to conductors

~~or devices other than overcurrent devices~~

(a) in the fire pump motor circuit(s). Exception No. 3: The requirement to carry the locked rotor currents indefinitely shall not apply to feeder overcurrent protective devices installed in accordance with 695.3(C) .

~~[**20:** 9.2.3.4]~~

(a)

(2) Overcurrent protection shall be provided by an assembly listed for fire pump service and complying with the following:

(3) The overcurrent protective device shall not open within 2 minutes at 600 percent of the full-load current of the fire pump motor(s).

(4) The overcurrent protective device shall not open with a re-start transient of 24 times the full-load current of the fire pump motor(s).

(5) The overcurrent protective device shall not open within 10 minutes at 300 percent of the full-load current of the fire pump motor(s).

(6) The trip point for circuit breakers shall not be field adjustable. [**20:** 9.2.3.4.1]

(g) *On-Site Standby Generators.* Overcurrent protective devices between an on-site standby generator and a fire pump controller shall be selected and sized to allow for instantaneous pickup of the full pump room load, but shall not be larger than the value selected to comply with 430.62 to provide short-circuit protection only. [**20:**9.6.1.1]

Additional Proposed Changes

File Name	Description	Approved
695.4_B_2_a_1_.docx	This file shows the proposed revisions clearly.	✓

Statement of Problem and Substantiation for Public Input

The proposed revisions align 695.4(B)(2)(a)(1) with Clause 9.2.3.4 of NFPA 20 and create exceptions for requirements embedded in
(a)(1) to improve clarity and readability of this section.

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Submittal Date: Sun Sep 03 12:30:20 EDT 2017

Copyright Assignment

I, John Kovacik, 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 John Kovacik, 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. 262-NFPA 70-2017 [Section No. 695.6(A)(1)]

(1) Services and On-Site Power Production Facilities.

Service conductors and conductors supplied by on-site power production facilities shall comply with the following

(a) shall be physically routed outside a building(s) and

(b) shall be installed as service-entrance conductors in accordance with 230.6, 230.9, and Parts III and IV of Article 230.

(c) Where supply conductors cannot be physically routed outside of buildings, the conductors shall be permitted to be routed through the building(s) where installed in accordance with 230.6(1) or (2)~~.~~

(d) If there is no neutral load it shall be permitted to omitte the neutral and install a suply side equipment bonding jumper

Statement of Problem and Substantiation for Public Input

did not know were this would fit so I submitted it here as well

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 871-NFPA 70-2017 [Section No. 695.3(A)(1)]	

Submitter Information Verification

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Organization: master

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City:

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Submittal Date: Sun Feb 19 13:13:09 EST 2017

Public Input No. 3126-NFPA 70-2017 [Section No. 695.6(A)(1)]

<u>(1)</u> Services and On-Site Power Production Facilities.

Service conductors and conductors supplied by on-site power production facilities shall be physically routed outside a building(s) and shall be installed as service-entrance conductors in accordance with 230.6, 230.9, and Parts III and IV of Article 230. Where supply conductors cannot be physically routed outside of buildings, the conductors shall be permitted to be routed through the building(s) where installed in accordance with 230.6(1) or (2).

<u>Informatonal Note: See section 250.24 (C) for grounded conductor brought to service equipment.</u>

Additional Proposed Changes

File Name	Description	Approved
.1504266295381		✓

Statement of Problem and Substantiation for Public Input

Fire Pump Service Conductors are typically run under concrete slab to directly feed the Fire Pump Controller-Automatic Transfer Switch which has to be listed for fire pump service. Since Fire Pump Controller-ATS is being used as Service Equipment it has to be listed for being suitable for use as Service Equipment as per section 9.2.3.1 of NFPA 20- 2016 edition.

As such we need to comply with section 250.24 (C) of NEC-2017 and bring the grounded conductor (neutral) to this piece of equipment on the line side of Fire Pump Controller-ATS. During plan review we find that many times the design engineers provide only three conductors even on the line side since it is a three phase motor load. At times the installers also miss it in the field if they don’t go by the approved plans which cause delays and expense to rectify the situation. An informational note at the bottom of section 695.6 (A) (1) will alert the design engineers and installers to meet this code requirement.

Submitter Information Verification

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Submittal Date: Fri Sep 01 07:43:23 EDT 2017

Public Input No. 1446-NFPA 70-2017 [New Section after 695.6(A)(1)]

TITLE OF NEW CONTENT

Type your content here ...

Exception to 695.6(A)(1) The Supply conductors that enter a Fire Pump room shall be considered as being outside the building, and are not required to meet the requirements of 230.6 (1) or (2) (concrete or brick encasement) unless otherwise required by 700.10(D) of this code.

Statement of Problem and Substantiation for Public Input

Reason: The Fire Pump room is required to be of a 2 hr fire rating and also have Fire sprinkler protection. I recently had a project where the engineer's changed the equipment layout in the fire pump room

and the supply conduit had already been stubbed up in the slab. I had to run that supply conduit about 20 feet across the F.P. room to the FP. Controller and then I ran the Feeder conduit from the controller

to the fire pump motor. The inspector correctly citing existng code required the supply conduit to be encased in concrete but Not the feeder to the pump motor. It does not make sense to me, since the

Fire pump won't work if either of these burn and short out. It seems to me the code requires the fire pump and controller to be in a 2 hour fire rated room to keep a fire from the building from spreading

into the fire pump room and if a fire starts inside the room then the fire sprinklers will exinguish the fire protecting the fire pump equipment.

Submitter Information Verification

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Submittal Date: Mon Jul 31 10:37:17 EDT 2017

Public Input No. 3331-NFPA 70-2017 [Section No. 695.6(A)(2)]

(2) Feeders.

Fire pump supply conductors on the load side of the final disconnecting means and overcurrent device(s) permitted by 695.4(B), or conductors that connect directly to an on-site standby generator, shall comply with all of the following:

(a) *Independent Routing.* The conductors shall be kept entirely independent of all other wiring.

(b) *Associated Fire Pump Loads.* The conductors shall supply only loads that are directly associated with the fire pump system.

(c) *Protection from Potential Damage.* The conductors shall be protected from potential damage by fire, structural failure, or operational accident. When installed on exterior of building, it shall be located 9.0 m (30 ft) away from adjacent buildings or combustable materials, or installed using 695.6(A)(2)(d).

(d) *Inside of a Building.* Where routed through a building, the conductors shall be protected from fire for 2 hours using one of the following methods:

(5) The cable or raceway is encased in a minimum 50 mm (2 in.) of concrete.

(6) The cable or raceway is a listed fire-resistive cable system.

Informational Note 1: Fire-resistive cables are tested to ANSI/UL 2196, *Tests for Fire Resistive Cables* .

Informational Note 2: The listing organization provides information for fire-resistive cable systems on proper installation requirements to maintain the fire rating.

(7) The cable or raceway is a listed electrical circuit protective system.

Informational Note 1: Electrical circuit protective systems could include, but are not limited to, thermal barriers or a protective shaft and are tested in accordance with UL 1724, *Fire Tests for Electrical Circuit Protection Systems* .

Informational Note 2: The listing organization provides information for electrical circuit protective systems on proper installation requirements to maintain the fire rating.

Exception to (A)(2)(d): The supply conductors located in the electrical equipment room where they originate and in the fire pump room shall not be required to have the minimum 2-hour fire separation or fire-resistance rating, unless otherwise required by 700.10(D) of this Code .

Statement of Problem and Substantiation for Public Input

This proposal is to address protection of fire pump feeders when installed outside of buildings they subject to fire damage by adjacent structures or building, especially when the buildings are attached.
The current requirements does not address or provide protection from fire, only physical protection.
In existing buildings, the easiest path from the on-site standby generator down to new fire pump is across the roof or on the exterior side walls. Large condensed cities have buildings either attached or few feet away from each others, even the new trend now is over-build or cantilever buildings, which when one building sells the air right to adjacent building to intrude and build above the first building.

Please note that the proposal only amended subsection (c) but the editing text tool underlined other sections.

Submitter Information Verification

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Submittal Date: Tue Sep 05 14:29:23 EDT 2017

Public Input No. 1965-NFPA 70-2017 [Section No. 695.6(B)]

(B) Conductor Size.

(1) Fire Pump Motors and Other Equipment.

Conductors supplying a fire pump motor(s), pressure maintenance pumps, and associated fire pump accessory equipment shall have ~~a~~ an ampere rating not less than 125 percent of the sum of the fire pump motor(s) and pressure maintenance motor(s) full-load current(s), and 100 percent of the associated fire pump accessory equipment, in accordance with 110 .14(C).

(2) Fire Pump Motors Only.

Conductors supplying only a fire pump motor shall ~~have a minimum ampacity~~ be sizing in accordance with 430.22 and shall comply with the voltage drop requirements in 695.7.

Statement of Problem and Substantiation for Public Input

No. 1. Edit to clarify that the rating is 'ampacity' and it's important that we provide a reference to 110.14(C) for conductors sizing.
No. 2. Reference to 'size' is better than 'ampacity.

Submitter Information Verification

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Submittal Date: Wed Aug 09 12:16:49 EDT 2017

Public Input No. 4204-NFPA 70-2017 [Section No. 695.6(G)]

(G) Ground-Fault Protection of Equipment.

Ground-fault protection of equipment shall not be installed in any fire pump power circuit. [**20:**9.1.8.1]

Informational Note: A great majority of electrrical faults are of the phase to ground type.Safety of the personnel and reliability of the system can be enhanced by use of high impedance grouding system.High impedance grouding will insert an impedance in the ground fault return path limiting the ground fault currrent to 10 amperes or less. This allows a safer operation with reduced ground fault current and leaving insufficient falt energy for an arc flash hazard level and equipment damage. High impedance grounding system will not affect arc flash energy for line -to-line and line-to line -to line faults. See Annex O NFPA 70E Standard for Electrical Safety in the Workplace for details.

See 250.36 and 250.187 for details of high impedance grounding system for systems 1000 volts and below and over 1000 Volts respectively,

Statement of Problem and Substantiation for Public Input

Fire pumps electrical circuit is a ground fault tolerant electrical systems ,Ground fault protection is not allowed in Fire pumps electrical circuits but when a ground fault happens in an electrical system damage to the equipment can occcur. A great majority of electrical faults initiate as phase to ground fault and escalate to line-to-line faults. In a solidly grounded system tens of thousands of amperes can flow in the system when a ground fault occurs. This can create an arc flash hazard and also equipment damage due to this high ground fault current. High impedance grounding of electrical system can limit this tens of thousands of amperes of ground fault current to 10 amperes of less. This can reduce arc flash hazard and equipment damage caused by tens of thousands of ground fault current in a solidly grounded system, An electrical system equipped with high impedance grounded system can be identified for maintenance personnel...A Fire pump electrical system with high impedance grouded system is notonlt fault tolerant but is also safer than solidly grounded system and is easily repairable

Submitter Information Verification

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Public Input No. 1287-NFPA 70-2017 [Section No. 695.6(I)]

(I) Junction Boxes.

Where fire pump wiring to or from a fire pump controller is routed through a junction box, the following requirements shall be met:

(1) The junction box shall be securely mounted. [**20:**9.7(1)]

(2) Mounting and installing of a junction box shall not violate the enclosure type rating of the fire pump controller(s). [**20:**9.7(2)]

(3) Mounting and installing of a junction box shall not violate the integrity of the fire pump controller(s) and shall not affect the short-circuit current rating of the controller(s). [**20:**9.7(3)]

(4) As a minimum, a Type 2, drip-proof enclosure (junction box) shall be used where installed in the fire pump room. The enclosure shall be listed to match the fire pump controller enclosure type rating. [**20:**9.7(4)]

(5) Terminals, junction blocks, wire connectors, and splices, where used, shall be listed. [**20:**9.7(5)]

(6) A fire pump controller or fire pump power transfer switch, where provided, shall not be used as a junction box to supply other equipment, including a pressure maintenance (jockey) pump(s).

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. 1249-NFPA 70-2017 [Section No. 110.24(A)]	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. 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

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Submittal Date: Mon Jul 24 20:06:42 EDT 2017

Public Input No. 2816-NFPA 70-2017 [Section No. 695.6(J)]

(J) Raceway Terminations.

Where raceways are terminated at a fire pump controller, the following requirements shall be met: [**20:**9.9]

(1) Listed conduit hubs shall be used. [**20:**9.9.1]

(2) The type rating of the conduit hub(s) shall be at least equal to that of the fire pump controller. [**20:**9.9.2]

(3) The installation instructions of the manufacturer of the fire pump controller shall be followed. [**20:**9.9.3]

(4) Alterations to the fire pump controller, other than conduit entry as allowed elsewhere in this *Code*, shall be ~~approved~~ evaluated by the ~~authority having jurisdiction~~ original listing organization . [**20:**9.9.4]

Statement of Problem and Substantiation for Public Input

Any modifications to a listed equipment must be re-evaluated to insure electrical safety. AHJ doesn't have the means or methods to evaluate a field modification.

Submitter Information Verification

Submitter Full Name: MATHHER ABBASSI

Organization: NYC DEPARTMENT OF BUILDINGS

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Submittal Date: Sat Aug 26 22:38:15 EDT 2017

Public Input No. 2850-NFPA 70-2017 [Section No. 695.6(J)]

(J) Raceway Terminations.

Where raceways or cables are terminated at a fire pump controller, the following requirements shall be met: [**20:**9.9]

(1) Listed conduit ~~hubs~~ or cable fittings shall be used. [**20:**9.9.1]

(2) The type rating of the conduit ~~hub(s)~~ or cable fittings shall be at least equal to that of the fire pump controller. [**20:**9.9.2]

(3) The installation instructions of the manufacturer of the fire pump controller shall be followed. [**20:**9.9.3]

(4) Alterations to the fire pump controller, other than conduit entry as allowed elsewhere in this *Code*, shall be approved by the authority having jurisdiction. [**20:**9.9.4]

Statement of Problem and Substantiation for Public Input

Several wiring methods are listed as suitable for wiring to and from fire pump controllers, including standard wiring methods between a junction box and the controller for power wiring. In addition, 695.6(D) states Power Wiring. All wiring from the controllers to the pump motors shall be in rigid metal conduit, intermediate metal conduit, electrical metallic tubing, liquidtight flexible metal conduit, or liquid tight flexible nonmetallic conduit, listed Type MC cable with an impervious covering, or Type MI cable.

Since only threaded raceways (RMC and IMC) are permitted to be terminated at a hub, there is a significant conflict between 695.6(D), (I) and (J) and 695.14(E) between permitted wiring methods and permitted terminations. As the wording stands currently, only RMC and IMC are permitted to be terminated at a fire pump controller.

(Note: a companion input will be submitted to NFPA 20 for the next revision cycle to coordinate the two requirements).

Submitter Information Verification

Submitter Full Name: Vince Baclawski

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Submittal Date: Mon Aug 28 11:47:06 EDT 2017

Public Input No. 630-NFPA 70-2017 [Section No. 695.6(J)]

(J) Raceway Terminations.

Where raceways are terminated at a fire pump controller, the following requirements shall be met: [**20:**9.9]

(1) ~~Listed conduit hubs shall be used. [**20:** 9.9.1]~~ Fittings listed for a wet location

(2) The type rating of the ~~conduit hub(s)~~ fitting shall be at least equal to that of the fire pump controller. [**20:**9.9.2]

(3) The installation instructions of the manufacturer of the fire pump controller shall be followed. [**20:**9.9.3]

(4) Alterations to the fire pump controller, other than conduit entry as allowed elsewhere in this *Code*, shall be approved by the authority having jurisdiction. [**20:**9.9.4]

Additional Proposed Changes

File Name	Description	Approved
WL_CONN.jpg	emt fitting	✓
Picture1.png	threaded hubs	✓

Statement of Problem and Substantiation for Public Input

The NEC recently relaxed the restrictions of wiring methods to include EMT, sealtight and pvc coated MC. However in 2014 article 695 started to require threaded hubs to align with NFPA 20. The conflict is allowing wiring methods that have fittings only listed for lock nuts and that threaded hubs have only been listed for Rigid. A listed water tight fitting shall be allowed versus encouraging the industry to intentionally violate UL standards. I have been an inspector for 16 years and can assure you most will use fittings threaded into the required hub. IF this is that important we should go back to allowing only Rigid. You may believe that their are fittings that transition "go-froms" I am stating that the majority of the industry is is either ignoring this fact or are unaware. Panel 13 can set this right

Submitter Information Verification

Submitter Full Name: James Dorsey

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Submittal Date: Mon May 01 20:06:05 EDT 2017


WET LOC
2" SCI WET LOC


ELECTRIC FIRE PUMP CONTROLLER
CIRCUIT BREAKER
DISCONNECTING MEANS


Public Input No. 2639-NFPA 70-2017 [Section No. 695.14(F)]

(F) Generator Control Wiring Methods.

Control conductors installed between the fire pump power transfer switch and the standby generator supplying the fire pump during normal power loss shall be kept entirely independent of all other wiring. The integrity of the generator control wiring shall be ~~continuously~~ monitored. Loss of integrity of the remote start circuit(s) shall initiate visual and audible annunciation of generator malfunction at the generator local and remote annunciator(s) and start the generator(s).

Informational Note: See NFPA 20-2013, *Standard for the Installation of Stationary Pumps for Fire Protection*, Section 3.3.7.2, for more information on fault-tolerant external control circuits.

The control conductors shall be protected to resist potential damage by fire or structural failure. They shall be permitted to be routed through a building(s) using one of the following methods:

(1) Be encased in a minimum 50 mm (2 in.) of concrete.

(2) Be protected by a fire-rated assembly listed to achieve a minimum fire rating of 2 hours and dedicated to the fire pump circuits.

(3) Be a listed electrical circuit protective system with a minimum 2-hour fire rating. The installation shall comply with any restrictions provided in the listing of the electrical circuit protective system used.

Informational Note: The listing organization provides information for electrical circuit protective systems on proper installation requirements to maintain the fire rating.

Statement of Problem and Substantiation for Public Input

In order to monitor the integrity of the start circuit, two start signals would be required, one normally open and one normally closed, that simultaneously change state to indicate engine start. Should the normally open contact wiring short, the generator would see only one contact change state, and can signal generator malfunction, and start the generator. Similarly, if the normally closed contact is cut.

However, if the normally open contact wring is cut, or the normally closed contact wiring shorted, the generator control panel will not sense this change of state until the transfer switch loses normal power or put into test mode, and is actually calling for the emergency generator to start.

The wiring is monitored for integrity, but not "continuously" monitored. Significantly more hardware and electronics, and complicated programming would be required to continuously monitor the start circuit conductors.

Submitter Information Verification

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Submittal Date: Wed Aug 23 10:12:35 EDT 2017

Copyright Assignment

I, Daniel Caron, 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 Daniel Caron, 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. 3466-NFPA 70-2017 [Section No. 695.14(F)]

(F) Generator Control Wiring Methods.

Control conductors installed between the fire pump power transfer switch and the standby generator supplying the fire pump during normal power loss shall be kept entirely independent of all other wiring. The integrity of the ~~generator control wiring shall~~ generator remote start circuit shall be continuously monitored for broken, disconnected, or shorted (to ground) wires . Loss of ~~integrity of the remote start circuit(s) shall~~ integrity shall initiate visual and audible annunciation of generator malfunction at the generator local and remote annunciator(s) and start the generator(s).

Informational Note: See NFPA 20-2013, *Standard for the Installation of Stationary Pumps for Fire Protection*, Section 3.3.7.2, for more information on fault-tolerant external control circuits.

The control conductors shall be protected to resist potential damage by fire or structural failure. They shall be permitted to be routed through a building(s) using one of the following methods:

(1) Be encased in a minimum 50 mm (2 in.) of concrete.

(2) Be protected by a fire-rated assembly listed to achieve a minimum fire rating of 2 hours and dedicated to the fire pump circuits.

(3) Be a listed electrical circuit protective system with a minimum 2-hour fire rating. The installation shall comply with any restrictions provided in the listing of the electrical circuit protective system used.

Informational Note: The listing organization provides information for electrical circuit protective systems on proper installation requirements to maintain the fire rating.

Statement of Problem and Substantiation for Public Input

The new requirement introduced in this article (in 2017) was too vague. What does “integrity of the generator control wiring shall be monitored” really mean? Left as is, the requirement could drive solutions that are all over the map, making crisp enforcement difficult.

Clarify by stating that we’re talking about the generator remote start circuit, and by defining that loss of integrity means broken, disconnected, or shorted (to ground) wires.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3462-NFPA 70-2017 [Section No. 700.10(D)(3)]	

Submitter Information Verification

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Submittal Date: Wed Sep 06 11:03:42 EDT 2017

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Public Input No. 676-NFPA 70-2017 [Section No. 695.14(F)]

(F) Generator Control Wiring Methods.

Control conductors installed between the fire pump power transfer switch and the standby generator supplying the fire pump during normal power loss shall be kept entirely independent of all other wiring. The integrity of the generator control wiring shall be continuously monitored. Loss of integrity of the remote start circuit(s) shall initiate visual and audible annunciation of generator malfunction at the generator local and remote annunciator(s) and start the generator(s).

Informational Note: See NFPA 20-2013, *Standard for the Installation of Stationary Pumps for Fire Protection*, Section 3.3.7.2, for more information on fault-tolerant external control circuits.

The control conductors shall be protected to resist potential damage by fire or structural failure.

~~They shall be permitted to be~~
Where routed through a building

~~(s)~~
, the conductors shall be protected from fire for 2 hours using one of the following methods:

~~Be Be~~

(1) The cable or raceway is encased in a minimum 50 mm (2 in.) of concrete.

- ~~Be protected by a fire-rated assembly listed to achieve a minimum fire rating of 2 hours and dedicated to the fire pump circuits.~~

(1) The cable or raceway is a listed fire-resistive cable system.

Informational Note 1: Fire-resistive cables are tested to ANSI/UL 2196, *Tests for Fire Resistive Cables* .

Informational Note 2: The listing organization provides information for fire-resistive cable systems on proper installation requirements to maintain the ?re rating.

(2) The cable or raceway is a listed electrical circuit protective system

~~with a minimum 2-hour fire rating. The installation shall comply with any restrictions provided in the listing of the electrical circuit protective system used~~

(1) .

Informational Note 1: Electrical circuit protective systems could include, but are not limited to, thermal barriers or a protective shaft and are tested in accordance with UL 1724, *Fire Tests for Electrical Circuit Protection Systems* .

Informational Note 2 : The listing organization provides information for electrical circuit protective systems on proper installation requirements to maintain the fire rating.

Statement of Problem and Substantiation for Public Input

This public input will not render correctly in Terra View. I don't know why. All of my other public inputs rendered correctly.

The reason for this change is to have consistency within the code.

Basically, I'm modifying 695.14(F) with the new language that is found in 695.6(A)(2)(d) subsections (1), (2), and (3) with regard to the routing of conductors inside a building. I believe this was a simple oversight and that this language should have been revised in the 2017 cycle. The finished product should look like this:

****

Where routed through a building, the conductors shall be protected from fire for 2 hours using one of the following methods:

(1) The cable or raceway is encased in a minimum 50 mm (2 in.) of concrete.
(2) The cable or raceway is a listed fire-resistive cable system.

Informational Note 1: Fire-resistive cables are tested to ANSI/UL 2196,Tests for Fire Resistive Cables.

Informational Note 2: The listing organization provides information for fire-resistive cable systems on proper installation requirements to maintain the fire rating.

(3) The cable or raceway is a listed electrical circuit protective system.

Informational Note 1: Electrical circuit protective systems could include, but are not limited to, thermal barriers or a protective shaft and are tested in accordance with UL 1724, Fire Tests for Electrical Circuit Protection Systems.

Informational Note 2: The listing organization provides information for electrical circuit protective systems on proper installation requirements to maintain the fire rating.

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Copyright Assignment

Public Input No. 3181-NFPA 70-2017 [Section No. 700.1]

700.1 Scope.

This article applies to the electrical safety of the installation, operation, and maintenance of emergency systems consisting of circuits and equipment intended to supply, distribute, and control electricity for illumination, power, or both, to required facilities when the normal electrical supply or system is interrupted.

Informational Note No. 1: For further information regarding wiring and installation of emergency systems in health care facilities, see Article 517.

Informational Note No. 2: For further information regarding performance and maintenance of emergency systems in health care facilities, see NFPA 99-2015, *Health Care Facilities Code*.

Informational Note No. 3: For specification of locations where emergency lighting is considered essential to life safety, see NFPA *101*-2015, *Life Safety Code*.

Informational Note No. 4: For further information regarding performance of emergency and standby power systems, see NFPA 110-2013, *Standard for Emergency and Standby Power Systems*.

<u>Informational Note No. 5: For further information regarding the reliability of emergency and standby power systems, see IEEE 3006.7, Recommended Practice for Determining the Reliability of 7x24 Continuous Power Systems in Industrial and Commercial Facilities</u>

Statement of Problem and Substantiation for Public Input

.This is the authoritative document for all of the systems covered in Articles 700 through 708 and should be the foundation for designing, constructing, inspecting and maintaining these power systems.

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 leading practice from transactions among academic and practitioners supports the NFPA International mission of eliminating death, injury, property and economic loss due to fire, electrical and related hazards.

More complete information is available from IEEE at the link below:

https://standards.ieee.org/findstds/standard/3006.7-2013.html

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Public Input No. 1634-NFPA 70-2017 [Definition: Luminaire, Directly Controlled.]

Emergency Luminaire, Directly Controlled.

An emergency luminaire that has a control input for an integral dimming or switching function that drives the luminaire to ~~full~~ the required emergency illumination level upon loss of normal power.

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

Statement of Problem and Substantiation for Public Input

There are types of directly controlled luminaires other than those used for emergency systems. The addition of the word “emergency” to the name of the device clarifies that this definition only applies to those directly controlled luminaires used in emergency systems. In addition, the original definition of Directly Controlled Luminaire introduced in the 2017 NEC covered only those Directly Controlled Luminaires with a control input that drove the luminaire to full illumination upon loss of normal power. However, there are Listed Directly Controlled Luminaires that are intelligent, and thus allow the control input to drive the luminaire to a brightness level less than full that is sufficient to provide the required emergency illumination level at the installed position of the luminaire. This change accommodates these types of Directly Controlled Luminaires.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 1635-NFPA 70-2017 [Section No. 700.24]	Coordination with revised defintion of directly controlled luminaire

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Public Input No. 2245-NFPA 70-2017 [Section No. 700.2]

700.2 Definitions.

~~**Branch Circuit Emergency Lighting Transfer Switch.**~~

~~A device connected on the load side of a branch circuit overcurrent protective device that transfers only emergency lighting loads from the normal supply to an emergency supply.~~

~~Informational Note: See ANSI/UL 1008, *Transfer Switch Equipment* , for information covering branch circuit emergency lighting transfer switches.~~

(A) Application Within this Article and throughout the Code. The following definition shall apply within this article and throughout the code.

Emergency Systems.

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

Informational Note: Emergency systems are generally installed in places of assembly where artificial illumination is required for safe exiting and for panic control in buildings subject to occupancy by large numbers of persons, such as hotels, theaters, sports arenas, health care facilities, and similar institutions. Emergency systems may also provide power for such functions as ventilation where essential to maintain life, fire detection and alarm systems, elevators, fire pumps, public safety communications systems, industrial processes where current interruption would produce serious life safety or health hazards, and similar functions.

(B) Application Within this Article. The following definition shall apply only within this article.

Branch Circuit Emergency Lighting Transfer Switch.

A device connected on the load side of a branch circuit overcurrent protective device that transfers only emergency lighting loads from the normal supply to an emergency supply.

Informational Note: See ANSI/UL 1008, *Transfer Switch Equipment* , for information covering branch circuit emergency lighting transfer switches.

Luminaire, Directly Controlled.

An emergency luminaire that has a control input for an integral dimming or switching function that drives the luminaire to full illumination upon loss of normal power.

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

Relay, Automatic Load Control.

A device used to set normally dimmed or normally-off switched emergency lighting equipment to full power illumination levels in the event of a loss of the normal supply by bypassing the dimming/switching controls, and to return the emergency lighting equipment to normal status when the device senses the normal supply has been restored.

Informational Note: See ANSI/UL 924, *Emergency Lighting and Power Equipment*, for the requirements covering automatic load control relays.

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

Related Public Inputs for This Document

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

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Public Input No. 364-NFPA 70-2017 [Section No. 700.2]

700.2 Definitions.

Branch Circuit Emergency Lighting Transfer Switch.

A device connected on the load side of a branch circuit overcurrent protective device that transfers only emergency lighting loads from the normal supply to an emergency supply.

Informational Note: See ANSI/UL 1008, *Transfer Switch Equipment*, for information covering branch circuit emergency lighting transfer switches.

Cable Bundle.

A group of cables that are tied together or in contact with one another in a closely packed configuration for at least 1 m.

Emergency Systems.

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

Informational Note: Emergency systems are generally installed in places of assembly where artificial illumination is required for safe exiting and for panic control in buildings subject to occupancy by large numbers of persons, such as hotels, theaters, sports arenas, health care facilities, and similar institutions. Emergency systems may also provide power for such functions as ventilation where essential to maintain life, fire detection and alarm systems, elevators, fire pumps, public safety communications systems, industrial processes where current interruption would produce serious life safety or health hazards, and similar functions.

Luminaire, Directly Controlled.

An emergency luminaire that has a control input for an integral dimming or switching function that drives the luminaire to full illumination upon loss of normal power.

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

Relay, Automatic Load Control.

A device used to set normally dimmed or normally-off switched emergency lighting equipment to full power illumination levels in the event of a loss of the normal supply by bypassing the dimming/switching controls, and to return the emergency lighting equipment to normal status when the device senses the normal supply has been restored.

Informational Note: See ANSI/UL 924, *Emergency Lighting and Power Equipment*, for the requirements covering automatic load control relays.

Statement of Problem and Substantiation for Public Input

The term bundle is used in article 725.144 to specify ampacity of cable conductors under different bundled configurations. The proposed definition clarifies what is meant by a bundle in the context of installation of Class 1, Class 2, cables, and what minimum length constitutes a bundle. Without the length, one can conceive that bundle ampacity requirements are applicable to installations where the cables are routed through a sleeve or slot in the floor for very short distances (e.g. less than 600 mm).

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Public Input No. 378-NFPA 70-2017 [Section No. 700.3(B)]

(B) Tested Periodically.

Systems shall be tested periodically on a ~~schedule acceptable to the~~ schedule approved by the authority having jurisdiction to ensure the systems are maintained in proper operating condition.

Statement of Problem and Substantiation for Public Input

This change is not a technical change. It is intended to be editorial only. This revision is merely an attempt to provide consistent terminology throughout the code. I believe the better word to use in this instance is the term “approved” since it is defined in Article 100 and used throughout the code and generally understood by installers and inspectors alike.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 374-NFPA 70-2017 [Section No. 700.12(B)(1)]	use of term "Approved"

Submitter Information Verification

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Public Input No. 1288-NFPA 70-2017 [Section No. 700.4(A)]

(A) Capacity and Rating.

An emergency system shall have adequate capacity and rating for all loads to be operated simultaneously. The emergency system equipment shall be suitable for the ~~maximum~~ available fault current at its terminals.

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. 1249-NFPA 70-2017 [Section No. 110.24(A)]	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. 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

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Public Input No. 248-NFPA 70-2017 [Section No. 700.4(A)]

(A) Capacity and Rating.

An emergency system shall have adequate capacity and rating for all loads connected to ~~be operated simultaneously. The~~ the emergency system. The calculations of load on the emergency source shall be made in accordnace with Article 220 or by another approved method. The emergency system equipment shall be suitable for the maximum available fault current at its terminals.

Statement of Problem and Substantiation for Public Input

Article 220 has purview over feeder load calculations. The current code language could be interpreted as requiring the emergency source to have a larger output rating than the ampacity rating of the normal power supply. The calculation for a feeder for an emergency panelboard that was sized in accordance with Article 220 should also be allowed to serve as the sizing calculation for the emergency source of power. A 400A normal power feeder installed to a transfer switch should be allowed to be protected by an emergency generator with a 400A output. By allowing other approved methods, the load calculation shall be permitted to be calculated under engineering supervision.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 249-NFPA 70-2017 [Section No. 701.4]	The proposed changes reference Article 220 for sizing emergency/legally required sources of power

Submitter Information Verification

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Submittal Date: Thu Feb 16 10:37:56 EST 2017

Public Input No. 4067-NFPA 70-2017 [Section No. 700.4(A)]

(A) Capacity and Rating.

An emergency system shall have adequate capacity and rating ~~for all loads to be operated simultaneously~~ to meet the requirements of peak emergency demand . The emergency system equipment shall be suitable for the maximum available fault current at its terminals.

Statement of Problem and Substantiation for Public Input

We need to make sure we do not oversize our generators. Rarely do all loads in a building need emergency power and there is ample anecdotal evidence (from the run-time hours of de-commissioned generators and direct measurement) that emergency generators are being oversized. Replacement of word "simultaneously" will signal to designers and manufacturers that the NEC recognizes "right-sized" emergency power chains.

Energy codes and innovation are driving down the load presented by emergency lighting systems, for example. We have a great deal of actual measurements at the University of Michigan and other universities that emergency load across many facility classes is 2/3rds less than originally conceived in design.

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Public Input No. 2480-NFPA 70-2017 [Section No. 700.5]

700.5 Transfer Equipment.

(A) General.

~~Transfer equipment, including automatic transfer switches, shall be automatic, identified for emergency use, and approved by the authority having jurisdiction. Transfer~~ When an electric power production system is installed as a Non-parallel system, transfer equipment shall be designed and installed to prevent the inadvertent interconnection of normal and emergency sources of supply in any operation of the transfer equipment. ~~Transfer equipment and electric~~ Electric power production systems installed to permit operation in parallel with the normal source shall meet the requirements of Article 705.

(B) Bypass Isolation Switches.

Means shall be permitted to bypass and isolate the transfer equipment. Where bypass isolation switches are used, inadvertent parallel operation shall be avoided.

(C) Automatic Transfer Switches.

Automatic transfer switches shall be electrically operated and mechanically held ~~. Automatic transfer switches shall be~~ and listed for emergency system use.

(D) Use.

Transfer equipment shall supply only emergency loads.

(E) Documentation.

The short-circuit current rating of the transfer equipment, based on the specific overcurrent protective device type and settings protecting the transfer equipment, shall be field marked on the exterior of the transfer equipment.

Statement of Problem and Substantiation for Public Input

this section covers non-parallel and parallel installation. This new text makes this clear, the requirement for "identified for emergency use" is already covered in C as "listed". The criteria for the transfer switch is better suit in section C and not A. 110.2 already covers the AHJ requirement to approve.

Submitter Information Verification

Submitter Full Name: Alfio Torrisi
Organization: Master electrician
Street Address:
City:
State:
Zip:
Submittal Date: Sat Aug 19 09:49:36 EDT 2017

Public Input No. 1812-NFPA 70-2017 [Section No. 700.5(A)]

(A) General.

Transfer equipment, ~~including automatic transfer switches,~~ shall be automatic, identified for emergency use, and approved by the authority having jurisdiction. Transfer equipment shall be designed and installed to prevent the inadvertent interconnection of normal and emergency sources of supply in any operation of the transfer equipment. Transfer equipment and electric power production systems installed to permit operation in parallel with the normal source shall meet the requirements of Article 705.

Statement of Problem and Substantiation for Public Input

it says shall be automatic , there should be no "including" there is only one type allowed .....automatic.

Submitter Information Verification

Submitter Full Name: Alfio Torrisi

Organization: master electrician

Street Address:

City:

State:

Zip:

Submittal Date: Sun Aug 06 13:23:54 EDT 2017

Public Input No. 3475-NFPA 70-2017 [Section No. 700.5(A)]

(A) General.

Transfer equipment, including automatic transfer switches, shall be automatic, identified for emergency use, and approved by the authority having jurisdiction. Transfer equipment shall be designed and installed to prevent the inadvertent interconnection of normal and emergency sources of supply in any operation of the transfer equipment. Transfer equipment and electric power production systems installed to permit operation in parallel with the normal source shall meet the requirements of Article 705. Meter mounted transfer swiches shall not be permitted for emergency system use.

Statement of Problem and Substantiation for Public Input

This public input is one of four to address the use of meter mounted transfer switches. A public input has been submitted to 230.82 to recognize the use of these devices. A second public input has been submitted to permit these devices for manual use in optional standby systems. This public input is submitted to prohibit the use of meter mounted transfer switches in emergency systems.

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: Wed Sep 06 11:25:33 EDT 2017

Public Input No. 3869-NFPA 70-2017 [New Section after 700.5(E)]

(F) DC MICROGRIDS

Transfer switches shall not be required for emergency systems fed by dc microgrids that are designed to operate from the same power sources during normal and emergency operation.

Statement of Problem and Substantiation for Public Input

700.5(A) requires that "Transfer equipment shall be designed and installed to prevent the inadvertent interconnection of normal and emergency sources" however power from a dc microgrid can meet the requirements of Article 700 without requiring a transfer switch as the normal and emergency sources can be one and the same. A companion PI has been submitted to state the same concept in Article 712.
We are entering a time of new and different electric power systems - many will be dc microgrids with integral storage and multiple interconnected power sources. We need to provide for these systems, and their fundamental capability of supplying reliable emergency power. There are dc microgrid systems undergoing UL certification now for operation as Article 700 emergency systems.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3866-NFPA 70-2017 [New Section after 712.4]	

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 04:25:50 EDT 2017

Public Input No. 1885-NFPA 70-2017 [Section No. 700.6(B)]

(B) Carrying Load.

To indicate that the ~~battery is~~ emergency source is carrying load.

Statement of Problem and Substantiation for Public Input

Not all emergency sources are batteries. It is important to alert the user that the emergency source is carrying load, whether it is a battery, generator, or other emergency source. This is in alignment with what is required in 701.6(B), which requires indication that the standby source is carrying load.

Submitter Information Verification

Submitter Full Name: Paul Barnhart
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 08 01:26:01 EDT 2017

Public Input No. 3537-NFPA 70-2017 [Section No. 700.6(D)]

(D) Ground Fault.

To indicate a ground fault in solidly grounded wye emergency systems of more than 150 volts to ground and circuit-protective devices rated 1000 amperes or more. The sensor for the ground-fault signal devices shall be located at, or ahead of, the main system disconnecting means for the emergency source, and the maximum setting of the signal devices shall be for a ground-fault current of 1200 amperes. Instructions on the course of action to be taken in event of indicated ground fault shall be located at or near the sensor location.

For systems with multiple emergency sources connected to a paralleling bus, the ground fault sensor and main bonding jumper shall be permitted to be at an alternative location.

Statement of Problem and Substantiation for Public Input

The text change that occurred in the 2017 code was intended to allow a multiple generator system to have a single main bonding jumper in order to meet the objectives of 250.6 (A) and (B) in preventing objectionable current to flow. So, while the new text allows moving the ground fault sensor, it does not address the core issue of preventing the objectionable current flow without also moving the bonding point. Adding the new wording should resolve that point of potential concern.

Note that this change should also be applied in Article 701.6(D).

Submitter Information Verification

Submitter Full Name: Gary Olson
Organization: kW Rx LLC
Street Address:
City:
State:
Zip:
Submittal Date: Wed Sep 06 12:53:06 EDT 2017

Public Input No. 2271-NFPA 70-2017 [Section No. 700.8]

700.8 Surge Protection.

A listed SPD shall be installed in or on all emergency systems switchboards and panelboards.

Exception: When the main bus of two or more panelboards are interconnected to common overcurrent protective device, only the panelboard closest to the source of power shall be required to have a SPD .

Statement of Problem and Substantiation for Public Input

When feed through lugs or sub feed lugs interconnect egress lighting panels the SPD in the first panel will protect the rest of the panels from surges originating outside of the feeder to the panels. Placing additional SPDs at each panel offers little to no benefit and the cost of more than one SPD is wasted. In low and high rise buildings interconnecting the egress lighting panels on different floors together with a single feeder is a common solution, and one that is often an outcome of selective coordination.

Submitter Information Verification

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Submittal Date:	Tue Aug 15 18:29:51 EDT 2017

Public Input No. 2817-NFPA 70-2017 [Section No. 700.10(A)]

(A) Identification.

Emergency circuits shall be permanently marked so they will be readily identified as a component of an emergency circuit or system by the following methods:

(1) All boxes and enclosures (including transfer switches, generators, and power panels) for emergency circuits shall be permanently marked as a component of an emergency circuit or system.

(2) Where boxes or enclosures are not encountered, exposed cable or raceway systems shall be permanently marked to be identified as a component of an emergency circuit or system, at intervals not to exceed 7.6 m (25 ft).

Receptacles supplied from the emergency system shall have a distinctive color or marking, and shall also indicate the panelboard and circuit number supplying them on the receptacle cover plates or the receptacles.

Statement of Problem and Substantiation for Public Input

The added language to require the panelboard and the circuit serving the emergency come from Article 517. Identifying the source of these receptacles eliminates the unnecessary interruption of power to other emergency receptacles and save time when service is required for such receptacles.

Submitter Information Verification

Submitter Full Name: MATHHER ABBASSI
Organization: NYC DEPARTMENT OF BUILDINGS
Street Address:
City:
State:
Zip:
Submittal Date: Sat Aug 26 23:09:14 EDT 2017

Copyright Assignment

I, MATHHER ABBASSI, 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 MATHHER ABBASSI, 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. 1814-NFPA 70-2017 [Section No. 700.10(B)]

(B) Wiring.

Wiring of two or more emergency circuits supplied from the same source shall be permitted in the same raceway, cable, box, or cabinet. Wiring from an emergency source or emergency source distribution overcurrent protection to emergency loads shall be kept entirely independent of all other wiring and equipment, unless otherwise permitted in 700.10(B)(1) through (5):

(1) _ Wiring from the normal power source located in transfer equipment enclosures

(2) _ Wiring supplied from two sources in exit or emergency luminaires

(3) _ Wiring from two sources in a listed load control relay supplying exit or emergency luminaires, or in a common junction box, attached to exit or emergency luminaires

(4) _ Wiring within a common junction box attached to unit equipment, containing only the branch circuit supplying the unit equipment and the emergency circuit supplied by the unit equipment

(5) _ Wiring from an emergency source to supply emergency and other (nonemergency) loads in accordance with 700.10(B)(5)a. , b., c., and d. as follows:

  (6) _ Separate vertical switchgear sections or separate vertical switchboard sections, with or without a common bus, or individual disconnects mounted in separate enclosures shall be used to separate emergency loads from all other loads.

  (7) The common bus of separate sections of the switchgear, separate sections of the switchboard, or the individual enclosures shall be either of the following:

- ~~Supplied by single or multiple feeders without overcurrent protection at the source~~
- ~~Supplied by single or multiple feeders with overcurrent protection, provided that the overcurrent protection that is common to an emergency system and any non-emergency system(s) is selectively coordinated with the next downstream overcurrent protective device in the nonemergency system(s)~~

(1)

a.

Informational Note: For further information, see Informational Note Figure 700.10(B)(5)(b)(1) and Informational Note Figure 700.10(B)(5)(b)(2) .

Figure Informational Note Figure 700.10(B)(5)(b)(1) Single or Multiple Feeders without Overcurrent Protection

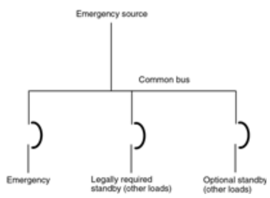
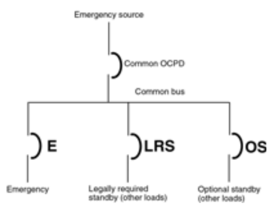


Figure Informational Note Figure 700.10(B)(5)(b)(2) Single or Multiple Feeders with Overcurrent Protection



i. Supplied by single or multiple feeders without overcurrent protection at the source

ii. Supplied by single or multiple feeders with overcurrent protection, provided that the overcurrent protection that is common to an emergency system and any non-emergency system(s) is selectively coordinated with the next downstream overcurrent protective device in the nonemergency system(s)

b. Emergency circuits shall not originate from the same vertical switchgear section, vertical switchboard section, panelboard enclosure, or individual disconnect enclosure as other circuits.

c. It shall be permissible to utilize single or multiple feeders to supply distribution equipment between an emergency source and the point where the emergency loads are separated from all other loads.

(6) Emergency and non-emergency systems originating from a generator termination to overcurrent devices seperating the loads.

Statement of Problem and Substantiation for Public Input

Something is wrong with Terraview I am adding number six only and not editing anything else.

You can have multiple feeders in the generators termination enclosure containing emergency and non emergency feeders. This new text will allow what is already happening in the field .

Submitter Information Verification

This PI has not been submitted yet

Copyright Assignment

Public Input No. 2615-NFPA 70-2017 [Section No. 700.10(B)]

(B) Wiring.

Wiring of two or more emergency circuits supplied from the same source shall be permitted in the same raceway, cable, box, or cabinet. Wiring from an emergency source or emergency source distribution overcurrent protection to emergency loads shall be kept entirely independent of all other wiring and equipment, unless otherwise permitted in 700.10(B)(1) through (~~5~~ 6):

(1) Wiring from the normal power source located in transfer equipment enclosures

(2) Wiring supplied from two sources in exit or emergency luminaires

(3) Wiring from two sources in a listed load control relay supplying exit or emergency luminaires, or in a common junction box, attached to exit or emergency luminaires

(4) Wiring within a common junction box attached to unit equipment, containing only the branch circuit supplying the unit equipment and the emergency circuit supplied by the unit equipment

(5) Wiring from an emergency source to supply emergency and other (nonemergency) loads in accordance with 700.10(B)(5)a., b., c., and d. as follows:

(6) Separate vertical switchgear sections or separate vertical switchboard sections, with or without a common bus, or individual disconnects mounted in separate enclosures shall be used to separate emergency loads from all other loads.

(7) The common bus of separate sections of the switchgear, separate sections of the switchboard, or the individual enclosures shall be either of the following:

(8) Supplied by single or multiple feeders without overcurrent protection at the source

(9) Supplied by single or multiple feeders with overcurrent protection, provided that the overcurrent protection that is common to an emergency system and any non-emergency system(s) is selectively coordinated with the next downstream overcurrent protective device in the nonemergency system(s)

Informational Note: For further information, see Informational Note Figure 700.10(B)(5)(b)(1) and Informational Note Figure 700.10(B)(5)(b)(2) .

Figure Informational Note Figure 700.10(B)(5)(b)(1) Single or Multiple Feeders without Overcurrent Protection

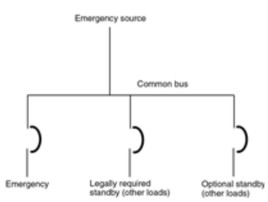
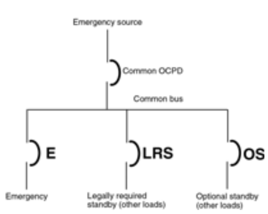


Figure Informational Note Figure 700.10(B)(5)(b)(2) Single or Multiple Feeders with Overcurrent Protection



(10) Emergency circuits shall not originate from the same vertical switchgear section, vertical switchboard section, panelboard enclosure, or individual disconnect enclosure as other circuits.

(11) It shall be permissible to utilize single or multiple feeders to supply distribution equipment between an emergency source and the point where the emergency loads are separated from all other loads.

(6) Wiring from an emergency source to supply emergency and other (non-emergency) loads where the source for both the emergency and non-emergency circuits is limited to and marked as conforming to the class 2 power limits of Article 725.

Additional Proposed Changes

File Name	Description	Approved
2020_NEC_Art_700.10_B_proposal.docx	Word version of 700.10(B) proposal	✓

Statement of Problem and Substantiation for Public Input

Separation of emergency from non-emergency circuits reduces the likelihood of an incident (such as a fire or overload) on the non-emergency circuit to cause damage to or impair the operation of a required emergency circuit. Where power levels are limited to class 2, the likelihood of any such incident is significantly reduced.

Significant improvements in luminaire energy efficiency have created widespread opportunities to deploy class 2 power, and its simpler wiring methods, for building illumination purposes. Among the technologies being deployed is Power over Ethernet (PoE) which is a fully digital system capable of enhanced communication and control. PoE lighting systems use communication cables and will benefit from content added to Article 725 in 2017 (such as the ampacity and bundling matrix of Table 725.144).

PoE luminaires can be used for emergency lighting purposes, but the normal vs. emergency circuit separation requirement of 700.10 creates what seems to be an unnecessary burden for this low power technology. PoE power sources can be ITE switches with multiple output ports, each of which is limited to within class 2 power limits.

Compliance with the current separation requirement will require multiple (separate) power sources and cable routing, without the risk of fire or other contaminating danger that exists for the class 1 circuits anticipated by the separation requirement. Providing relief from the separation requirement for low power circuits will simplify deployment of this beneficial technology.

Submitter Information Verification

Submitter Full Name: Michael Shulman
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 21 14:59:41 EDT 2017

700.10 Wiring, Emergency System.
(A) Identification
(B) Wiring. Wiring of two or more emergency circuits supplied from the same source shall be permitted in the same raceway, cable, box, or cabinet. Wiring from an emergency source or emergency source distribution overcurrent protection to emergency loads shall be kept entirely independent of all other wiring and equipment, unless otherwise permitted in 700.10(B)(1) through (6)~~(5)~~:
(1) Wiring from the normal power source located in transfer equipment enclosures
(2) Wiring supplied from two sources in exit or emergency luminaires
(3) Wiring from two sources in a listed load control relay supplying exit or emergency luminaires, or in a common junction box, attached to exit or emergency luminaires
(4) Wiring within a common junction box attached to unit equipment, containing only the branch circuit supplying the unit equipment and the emergency circuit supplied by the unit equipment
(5) Wiring from an emergency source to supply emergency and other (nonemergency) loads in accordance with 700.10(B)(5)a., b., c., and d. as follows:

a. Separate vertical switchgear sections or separate vertical switchboard sections, with or without a common bus, or individual disconnects mounted in separate enclosures shall be used to separate emergency loads from all other loads.

b. The common bus of separate sections of the switchgear, separate sections of the switchboard, or the individual enclosures shall be either of the following:

(i) Supplied by single or multiple feeders without overcurrent protection at the source

(ii) Supplied by single or multiple feeders with overcurrent protection, provided that the overcurrent protection that is common to an emergency system and any non-emergency system(s) is selectively coordinated with the next downstream overcurrent protective device in the nonemergency system(s)

Informational Note: For further information, see Informational Note Figure 700.10(B)(5)(b)(1) and Informational Note Figure 700.10(B)(5)(b)(2).

c. Emergency circuits shall not originate from the same vertical switchgear section, vertical switchboard section, panelboard enclosure, or individual disconnect enclosure as other circuits.

d. It shall be permissible to utilize single or multiple feeders to supply distribution equipment between an emergency source and the point where the emergency loads are separated from all other loads.

(6) Wiring from an emergency source to supply emergency and other (nonemergency) loads where the source for both the emergency and nonemergency circuits is limited to and marked as conforming to the class 2 power limits of Article 725.

Substantiation:

Separation of emergency from non-emergency circuits reduces the likelihood of an incident (such as a fire or overload) on the non-emergency circuit to cause damage to or impair the operation of a required emergency circuit. Where power levels are limited to class 2, the likelihood of any such incident is significantly reduced.

Significant improvements in luminaire energy efficiency have created widespread opportunities to deploy class 2 power, and its simpler wiring methods, for building illumination purposes. Among the technologies being deployed is Power over Ethernet (PoE) which is a fully digital system capable of enhanced communication and control. PoE lighting systems use communication cables and will benefit from content added to Article 725 in 2017 (such as the ampacity and bundling matrix of Table 725.144).

PoE luminaires can be used for emergency lighting purposes, but the normal vs. emergency circuit separation requirement of 700.10 creates what seems to be an unnecessary burden for this low power technology. PoE power sources can be ITE switches with multiple output ports, each of which is limited to within class 2 power limits. Compliance with the current separation requirement will require multiple (separate) power sources and cable routing, without the risk of fire or other contaminating danger that exists for the class 1 circuits anticipated by the separation requirement. Providing relief from the separation requirement for low power circuits will simplify deployment of this beneficial technology.

(F) Unit Equipment.
(1) Components of Unit Equipment. Individual unit equipment for emergency illumination shall consist of the following:
(1) A rechargeable battery
(2) A battery charging means
(3) Provisions for one or more lamps mounted on the equipment or shall be permitted to have terminals for remote lamps, or both
(4) A relaying device arranged to energize the lamps automatically upon failure of the supply to the unit equipment
(2) Installation of Unit Equipment. Unit equipment shall be installed in accordance with 700.12(F)(2)(1) through (6).
(1) The batteries shall be of suitable rating and capacity to supply and maintain the total lamp load associated with the unit in accordance with (a) or (b):

(a) For a period of at least 1-1⁄2 hours without the voltage falling below 871⁄2 percent of normal battery voltage

(b) The unit equipment shall supply and maintain not less than 60 percent of the initial emergency illumination for a period of at least 11⁄2 hours

(2) Unit equipment shall be permanently fixed (i.e., not portable) in place and shall have all wiring to each unit installed in accordance with the requirements of any of the wiring methods in Chapter 3. Flexible cord-and-plug connection shall be permitted, provided that the cord does not exceed 900 mm (3 ft) in length.
(3) The branch circuit feeding the unit equipment shall be the same branch circuit as that serving the normal lighting in the area and connected ahead of any local switches.
Exception: In a separate and uninterrupted area supplied by a minimum of three normal lighting circuits that are not part of a multiwire branch circuit, a separate branch circuit for unit equipment shall be permitted if it originates from the same panelboard as that of the normal lighting circuits and is provided with a lock-on feature.
(4) The branch circuit that feeds unit equipment shall be clearly identified at the distribution panel.
(5) Emergency luminaires that obtain power from a unit equipment and are not part of the unit equipment shall be wired to the unit equipment as required by 700.10 and by one of the wiring methods of Chapter 3, or by a wiring method permitted by Article 725 when the unit equipment output is marked as limited to class 2 power levels.

Substantiation:

700.10(C) requires emergency wiring to be located so as to minimize damage due to environmental (external) causes. There is no need for the current-handling capacity of the wiring to exceed what is warranted by the power source capacity. The output of unit equipment will always be within class 2 voltage limits (the supply source is the internal battery, typically from 6 – 24 Vdc). Most remote luminaires supplied from a unit equipment will be rated well below the class 2 100 VA power limit. This proposal allows the connecting conductors to be right-sized for the task.

700.12(F)(2) Installation of unit equipment. Add allowance to subclause (5) for class 2 wiring where the unit equipment is marked as having a class 2 output.

Public Input No. 2903-NFPA 70-2017 [Section No. 700.10(B)]

(B) Wiring.

Wiring of two or more emergency circuits supplied from the same source shall be permitted in the same raceway, cable, box, or cabinet. Wiring from an emergency source or emergency source distribution overcurrent protection to emergency loads shall be kept entirely independent of all other wiring and equipment, unless otherwise permitted in 700.10(B)(1) through (~~5~~ 6):

(1) Wiring from the normal power source located in transfer equipment enclosures

(2) Wiring supplied from two sources in exit or emergency luminaires

(3) Wiring from two sources in a listed load control relay supplying exit or emergency luminaires, or in a common junction box, attached to exit or emergency luminaires

(4) Wiring within a common junction box attached to unit equipment, containing only the branch circuit supplying the unit equipment and the emergency circuit supplied by the unit equipment

(5) Wiring from an emergency source to supply emergency and other (nonemergency) loads in accordance with 700.10(B)(5)a., b., c., and d. as follows:

   (6) Separate vertical switchgear sections or separate vertical switchboard sections, with or without a common bus, or individual disconnects mounted in separate enclosures shall be used to separate emergency loads from all other loads.

   (7) The common bus of separate sections of the switchgear, separate sections of the switchboard, or the individual enclosures shall be either of the following:

      (8) Supplied by single or multiple feeders without overcurrent protection at the source

      (9) Supplied by single or multiple feeders with overcurrent protection, provided that the overcurrent protection that is common to an emergency system and any non-emergency system(s) is selectively coordinated with the next downstream overcurrent protective device in the nonemergency system(s)

Informational Note: For further information, see Informational Note Figure 700.10(B)(5)(b)(1) and Informational Note Figure 700.10(B)(5)(b)(2) .

Figure Informational Note Figure 700.10(B)(5)(b)(1) Single or Multiple Feeders without Overcurrent Protection

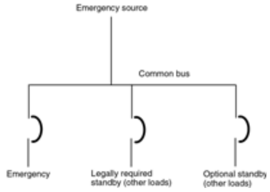
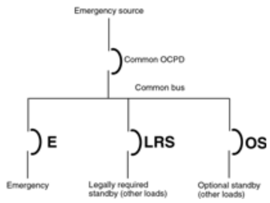


Figure Informational Note Figure 700.10(B)(5)(b)(2) Single or Multiple Feeders with Overcurrent Protection



   (10) Emergency circuits shall not originate from the same vertical switchgear section, vertical switchboard section, panelboard enclosure, or individual disconnect enclosure as other circuits.

   (11) It shall be permissible to utilize single or multiple feeders to supply distribution equipment between an emergency source and the point where the emergency loads are separated from all other loads.

(6) Wiring within multiple circuit lighting track in which at least one circuit is used to supply emergency luminaires.

Statement of Problem and Substantiation for Public Input

Section 700.10(B) contains a list of wiring methods that are permitted for normal and emergency circuits. One method that should be added would be multiple circuit lighting track that consists of at least two circuits. This application would allow a designer or installer to use at least one of the circuits for connection to emergency lighting luminaire's on a multiple circuit track system.

Please note that Terraview has underlined and renumbered list items that are not modified. This Public Input is intended to add new list item #6. There are no other modifications to the list items.

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:	Tue Aug 29 07:05:40 EDT 2017

Public Input No. 1268-NFPA 70-2017 [Section No. 700.10(D)(1)]

(1) Feeder-Circuit Wiring.

Feeder-circuit wiring shall meet one of the following conditions:

(1) The cable or raceway is installed in spaces or areas that are fully protected by an approved automatic fire suppression system.

(2) The cable or raceway is protected by a listed electrical circuit protective system with a minimum 2-hour fire rating.

Informational Note No. 1: Electrical circuit protective systems could include but not be limited to thermal barriers or a protective shaft and are tested to UL 1724, *Fire Tests for Electrical Circuit Protection Systems* .

Informational Note No. 2: The listing organization provides information for electrical circuit protective systems on proper installation requirements to maintain the fire rating.

(3) The cable or raceway is a listed fire-resistive cable system with a minimum 2-hour fire rating .

Informational Note No. 1: Fire-resistive cables are tested to ANSI/UL 2196, *Tests for Fire Resistive Cables* .

Informational Note No. 2: The listing organization provides information for fire-resistive cable systems on proper installation requirements to maintain the fire rating.

(4) The cable or raceway is protected by a listed fire-rated assembly that has a minimum fire rating of 2 hours and contains only emergency circuits.

(5) The cable or raceway is encased in a minimum of 50 mm (2 in.) of concrete.

Statement of Problem and Substantiation for Public Input

Article 700.10 (D) was revised in the 2017 cycle in an effort to make the Article more user friendly. However, paragraph 700.10 (D)(1)(3) of the final version is missing a key safety driven component discussed during both the First and Second Draft meetings; i.e. the requirement that a listed fire-resistance cable system is rated for 2 hours. This 2-hour fire rating is a critical part of the requirement and was inadvertently missed by the Technical Committee.

Note that this language is similar in Article 695 and identical in Article 708:
-In Article 695.6, similar language is found in paragraphs (A)(2)(d)(1) thru (A)(2)(d)(3); however, the parent paragraph, 695.6 (A)(2)(d), includes the qualifier “protected from fire for 2 hours”.
-In Article 708, identical language is found in paragraph 708.10(C)(2)(2).

Submitter Information Verification

Submitter Full Name: Daniel Caron

Organization: BR+A Consulting Engineers

Street Address:

City:

State:

Zip:

Submittal Date: Mon Jul 24 13:11:35 EDT 2017

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Public Input No. 3732-NFPA 70-2017 [Section No. 700.10(D)(1)]

(1) Feeder-Circuit Wiring.

Feeder-circuit wiring shall meet one of the following conditions:

(1) The cable or raceway is installed in spaces or areas that are fully protected by an approved automatic fire ~~suppression~~ protection system.

(2) The cable or raceway is protected by a listed electrical circuit protective system with a minimum 2-hour fire rating.

Informational Note No. 1: Electrical circuit protective systems could include but not be limited to thermal barriers or a protective shaft and are tested to UL 1724, *Fire Tests for Electrical Circuit Protection Systems* .

Informational Note No. 2: The listing organization provides information for electrical circuit protective systems on proper installation requirements to maintain the fire rating.

(3) The cable or raceway is a listed fire-resistive cable system.

Informational Note No. 1: Fire-resistive cables are tested to ANSI/UL 2196, *Tests for Fire Resistive Cables* .

Informational Note No. 2: The listing organization provides information for fire-resistive cable systems on proper installation requirements to maintain the fire rating.

(4) The cable or raceway is protected by a listed fire-rated assembly that has a minimum fire rating of 2 hours and contains only emergency circuits.

(5) The cable or raceway is encased in a minimum of 50 mm (2 in.) of concrete.

Statement of Problem and Substantiation for Public Input

The IBC and the IFC, and NFPA 5000 use and define the term "fire protection system", none of them use or define "fire suppression system".

Submitter Information Verification

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Public Input No. 2640-NFPA 70-2017 [Section No. 700.10(D)(3)]

(3) Generator Control Wiring.

Control conductors installed between the transfer equipment and the emergency generator shall be kept entirely independent of all other wiring and shall meet the conditions of 700.10(D)(1). The integrity of the generator control wiring shall be ~~continuously~~ monitored. Loss of integrity of the remote start circuit(s) shall initiate visual and audible annunciation of generator malfunction at the generator local and remote annunciator(s) and start the generator(s).

Statement of Problem and Substantiation for Public Input

In order to monitor the integrity of the start circuit, two start signals would be required, one normally open and one normally closed, that simultaneously change state to indicate engine start. Should the normally open contact wiring short, the generator would see only one contact change state, and can signal generator malfunction, and start the generator. Similarly, if the normally closed contact is cut.

However, if the normally open contact wring is cut, or the normally closed contact wiring shorted, the generator control panel will not sense this change of state until the transfer switch loses normal power or put into test mode, and is actually calling for the emergency generator to start.

The wiring is monitored for integrity, but not "continuously" monitored. Significantly more hardware and electronics, and complicated programming would be required to continuously monitor the start circuit conductors.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2639-NFPA 70-2017 [Section No. 695.14(F)]	

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Public Input No. 3462-NFPA 70-2017 [Section No. 700.10(D)(3)]

(3) Generator Control Wiring.

Control conductors installed between the transfer equipment and the emergency generator shall be kept entirely independent of all other wiring and shall meet the conditions of 700.10(D)(1). The integrity of the ~~generator control wiring~~ generator remote start circuit shall be continuously monitored for broken, disconnected, or shorted (to ground) wires . Loss of ~~integrity of the remote start circuit(s) shall~~ integrity shall initiate visual and audible annunciation of generator malfunction at the generator local and remote annunciator(s) and start the generator(s).

Statement of Problem and Substantiation for Public Input

The new requirement introduced in this article (in 2017) was too vague. What does "integrity of the generator control wiring shall be monitored" really mean? Left as is, the requirement could drive solutions that are all over the map, making crisp enforcement difficult.

Clarify by stating that we're talking about the generator remote start circuit, and by defining that loss of integrity means broken, disconnected, or shorted (to ground) wires.

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Public Input No. 584-NFPA 70-2017 [Section No. 700.12]

700.12 General Requirements.

Current supply shall be such that, in the event of failure of the normal supply to, or within, the building or group of buildings concerned, emergency lighting, emergency power, or both shall be available within the time required for the application but not to exceed 10 seconds. The supply system for emergency purposes, in addition to the normal services to the building and meeting the general requirements of this section, shall be one or more of the types of systems described in 700.~~12~~ 13 (A) through (E). Unit equipment in accordance with 700.~~12~~ 13 (F) shall satisfy the applicable requirements of this article.

(A) Source selection.

In selecting an emergency source of power, consideration shall be given to the occupancy and the type of service to be rendered, whether of minimum duration, as for evacuation of a theater, or longer duration, as for supplying emergency power and lighting due to an indefinite period of current failure from trouble either inside or outside the building.

(B) Source location

Equipment shall be designed and located so as to minimize the hazards that might cause complete failure due to flooding, fires, icing, and vandalism.

Equipment for sources of power as described in 700.~~12~~ 13 (A) through (E) shall be installed either in spaces fully protected by approved automatic fire suppression systems (sprinklers, carbon dioxide systems, and so forth) or in spaces with a 1-?hour fire rating where located within the following:

(1) Assembly occupancies for more than 1000 persons

(2) Buildings above 23 m (75 ft) in height with any of the following occupancy classes — assembly, educational, residential, detention and correctional, business, and mercantile

(3) Health care occupancies where persons are not capable of self-preservation

(4) Educational occupancies with more than 300 occupants

Informational Note No. 1: For the definition of *Occupancy Classification*, see Section 6.1 of NFPA *101*??-2015, *Life Safety Code*.

Informational Note No. 2: For further information, see ANSI/IEEE 493-2007, *Recommended Practice for the Design of Reliable Industrial and Commercial Power Systems*.

700.13 Source Type.

(A) Storage Battery.

Storage batteries shall be of suitable rating and capacity to supply and maintain the total load for a minimum period of 1½ hours, without the voltage applied to the load falling below 87½ percent of normal. Automotive-type batteries shall not be used.

An automatic battery charging means shall be provided.

(B) Generator Set.

(1) Prime Mover-Driven.

For a generator set driven by a prime mover acceptable to the authority having jurisdiction and sized in accordance with 700.4, means shall be provided for automatically starting the prime mover on failure of the normal service and for automatic transfer and operation of all required electrical circuits. A time-delay feature permitting a 15-minute setting shall be provided to avoid retransfer in case of short-time reestablishment of the normal source.

(2) Internal Combustion Engines as Prime Movers.

Where internal combustion engines are used as the prime mover, an on-site fuel supply shall be provided with an on-premises fuel supply sufficient for not less than 2 hours' full-demand operation of the system. Where power is needed for the operation of the fuel transfer pumps to deliver fuel to a generator set day tank, this pump shall be connected to the emergency power system.

(3) Dual Supplies.

Prime movers shall not be solely dependent on a public utility gas system for their fuel supply or municipal water supply for their cooling systems. Means shall be provided for automatically transferring from one fuel supply to another where dual fuel supplies are used.

Exception: Where acceptable to the authority having jurisdiction, the use of other than on-site fuels shall be permitted where there is a low probability of a simultaneous failure of both the off-site fuel delivery system and power from the outside electrical utility company.

(4) Battery Power and Dampers.

Where a storage battery is used for control or signal power or as the means of starting the prime mover, it shall be suitable for the purpose and shall be equipped with an automatic charging means independent of the generator set. Where the battery charger is required for the operation of the generator set, it shall be connected to the emergency system. Where power is required for the operation of dampers used to ventilate the generator set, the dampers shall be connected to the emergency system.

(5) Auxiliary Power Supply.

Generator sets that require more than 10 seconds to develop power shall be permitted if an auxiliary power supply energizes the emergency system until the generator can pick up the load.

(6) Outdoor Generator Sets.

Where an outdoor housed generator set is equipped with a readily accessible disconnecting means in accordance with 445.18, and the disconnecting means is located within sight of the building or structure supplied, an additional disconnecting means shall not be required where ungrounded conductors serve or pass through the building or structure. Where the generator supply conductors terminate at a disconnecting means in or on a building or structure, the disconnecting means shall meet the requirements of 225.36.

Exception: For installations under single management, where conditions of maintenance and supervision ensure that only qualified persons will monitor and service the installation and where documented safe switching procedures are established and maintained for disconnection, the generator set disconnecting means shall not be required to be located within sight of the building or structure served.

(C) Uninterruptible Power Supplies.

Uninterruptible power supplies used to provide power for emergency systems shall comply with the applicable provisions of 700.12(A) and (B).

(D) Separate Service.

Where approved by the authority having jurisdiction as suitable for use as an emergency source of power, an additional service shall be permitted. This service shall be in accordance with the applicable provisions of Article 230 and the following additional requirements:

(1) Separate overhead service conductors, service drops, underground service conductors, or service laterals shall be installed.

(2) The service conductors for the separate service shall be installed sufficiently remote electrically and physically from any other service conductors to minimize the possibility of simultaneous interruption of supply.

(E) Fuel Cell System.

Fuel cell systems used as a source of power for emergency systems shall be of suitable rating and capacity to supply and maintain the total load for not less than 2 hours of full-demand operation.

Installation of a fuel cell system shall meet the requirements of Parts II through VIII of Article 692.

Where a single fuel cell system serves as the normal supply for the building or group of buildings concerned, it shall not serve as the sole source of power for the emergency standby system.

(F) Unit Equipment.

(1) Components of Unit Equipment.

Individual unit equipment for emergency illumination shall consist of the following:

(1) A rechargeable battery

(2) A battery charging means

(3) Provisions for one or more lamps mounted on the equipment, or shall be permitted to have terminals for remote lamps, or both

(4) A relaying device arranged to energize the lamps automatically upon failure of the supply to the unit equipment

(2) Installation of Unit Equipment.

Unit equipment shall be installed in accordance with 700.12(F)(2)(1) through (6).

(1) The batteries shall be of suitable rating and capacity to supply and maintain the total lamp load associated with the unit in accordance with (a) or (b):

(a) For a period of at least 1½ hours without the voltage falling below 87½ percent of normal battery voltage

(b) The unit equipment shall supply and maintain not less than 60 percent of the initial emergency illumination for a period of at least 1½ hours

(2) Unit equipment shall be permanently fixed (i.e., not portable) in place and shall have all wiring to each unit installed in accordance with the requirements of any of the wiring methods in Chapter 3. Flexible cord-and-plug connection shall be permitted, provided that the cord does not exceed 900 mm (3 ft) in length.

(3) The branch circuit feeding the unit equipment shall be the same branch circuit as that serving the normal lighting in the area and connected ahead of any local switches.

<u>Exception: In a separate and uninterrupted area supplied by a minimum of three normal lighting circuits that are not part of a multiwire branch circuit, a separate branch circuit for unit equipment shall be permitted if it originates from the same panelboard as that of the normal lighting circuits and is provided with a lock-on feature.</u>

(4) The branch circuit that feeds unit equipment shall be clearly identified at the distribution panel.

(5) Emergency luminaires that obtain power from a unit equipment and are not part of the unit equipment shall be wired to the unit equipment as required by 700.10 and by one of the wiring methods of Chapter 3.

(6) Remote heads providing lighting for the exterior of an exit door shall be permitted to be supplied by the unit equipment serving the area immediately inside the exit door.

Statement of Problem and Substantiation for Public Input

The introductory paragraph to 700.12 is a rather lengthy. It would be more appropriate to subdivide this section into more first level subdivisions to provide additional clarity and usability. The proposed subdivisions include source location, source type, and source selection that will accomplish this revision.

Submitter Information Verification

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Submittal Date: Sun Apr 23 19:47:15 EDT 2017

Copyright Assignment

Public Input No. 3824-NFPA 70-2017 [Section No. 700.12 [Excluding any Sub-Sections]]

Current supply shall be such that, in the event of failure of the normal supply to, or within, the building or group of buildings concerned, emergency lighting, emergency power, or both shall be available within the time required for the application but not to exceed 10 seconds. The supply system for emergency purposes, in addition to the normal services to the building and meeting the general requirements of this section, shall be one or more of the types of systems described in 700.12(A) through (E). Unit equipment in accordance with 700.12(F) shall satisfy the applicable requirements of this article.

In selecting an emergency source of power, consideration shall be given to the occupancy and the type of service to be rendered, whether of minimum duration, as for evacuation of a theater, or longer duration, as for supplying emergency power and lighting due to an indefinite period of current failure from trouble either inside or outside the building.

Equipment shall be designed and located so as to minimize the hazards that might cause complete failure due to flooding, fires, icing, and vandalism.

Equipment for sources of power as described in 700.12(A) through (E) shall be installed either in spaces fully protected by approved automatic fire suppression systems (sprinklers, carbon dioxide systems, and so forth) or in spaces with a 1-hour fire rating where located within the following:

(1) Assembly occupancies for more than 1000 persons

(2) Buildings above 23 m (75 ft) in height with any of the following occupancy classes — assembly, educational, residential, detention and correctional, business, and mercantile

(3) ~~Health care occupancies where persons are not capable of self-preservation~~

(4) Educational occupancies with more than 300 occupants

Informational Note No. 1: For the definition of *Occupancy Classification*, see Section 6.1 of NFPA *101*-2015, *Life Safety Code*.

Informational Note No. 2: For further information, see ANSI/IEEE 493-2007, *Recommended Practice for the Design of Reliable Industrial and Commercial Power Systems*.

Statement of Problem and Substantiation for Public Input

As the Chair of NFPA 99 Electrical Systems Committee (HEA-ELS), I am submitting this proposal to improve the correlation between NFPA 99 and NFPA 70. The substantiation of this proposal is as follows: The conflict between NFPA documents 70, 700.12 (3), and NFPA 99, may result in AHJs being unable to determine which of the code statements takes precedence. State health departments typically adopt NFPA 99 and will claim the cited NEC paragraph does not apply, local electrical inspectors will claim that the NEC takes precedence. The reference to “Health care occupancies” included under 700.10 (D) (3) was removed by this CMP under TIA log 1293. This reference to “Health care occupancies” should be removed as well under the same justification for the acceptance of TIA 1293.

Submitter Information Verification

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Public Input No. 4087-NFPA 70-2017 [Section No. 700.12 [Excluding any Sub-Sections]]

Current supply shall be such that, in the event of failure of the normal supply to, or within, the building or group of buildings concerned, emergency lighting, emergency power, or both shall be available within the time required for the application but not to exceed 10 seconds. The supply system for emergency purposes, in addition to the normal services to the building and meeting the general requirements of this section, shall be one or more of the types of systems described in 700.12(A) through (E). Unit equipment in accordance with 700.12(F) shall satisfy the applicable requirements of this article.

In selecting an emergency source of power, consideration shall be given to the occupancy and the type of service to be rendered, whether of minimum duration, as for evacuation of a theater, or longer duration, as for supplying emergency power and lighting due to an indefinite period of current failure from trouble either inside or outside the building.

Equipment shall be designed and located so as to minimize the hazards that might cause complete failure due to flooding, fires, icing, and vandalism.

Equipment for sources of power as described in 700.12(A) through (E) shall be installed either in spaces fully protected by approved automatic fire suppression systems (sprinklers, carbon dioxide systems, and so forth) or in spaces with a 1-hour fire rating where located within the following:

(1) Assembly occupancies for more than 1000 persons

(2) Buildings above 23 m (75 ft) in height with any of the following occupancy classes — assembly, educational, residential, detention and correctional, business, and mercantile

(3) Health care occupancies where persons are not capable of self-preservation

(4) Educational occupancies with more than 300 occupants

Informational Note No. 1: For the definition of *Occupancy Classification*, see Section 6.1 of NFPA *101*-2015, *Life Safety Code*.

Informational Note No. 2: For ~~further~~ information ~~, see ANSI/IEEE 493-2007,~~ regarding power system reliability see IEEE 3006.5 Recommended Practice for the ~~Design of Reliable~~ Use of Probability Methods for Conducting a Reliability Analysis of 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 IEEE 493 Design of Reliable Industrial and Commercial Power Systems -- the so-called “Gold Book”, which is now being sunsetted and superseded by 3006.5.

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/3006.5-2014.html

Submitter Information Verification

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Submittal Date: Thu Sep 07 13:50:52 EDT 2017

Public Input No. 4094-NFPA 70-2017 [Section No. 700.12 [Excluding any Sub-Sections]]

Current supply shall be such that, in the event of failure of the normal supply to, or within, the building or group of buildings concerned, emergency lighting, emergency power, or both shall be available within the time required for the application but not to exceed 10 seconds. The supply system for emergency purposes, in addition to the normal services to the building and meeting the general requirements of this section, shall be one or more of the types of systems described in 700.12(A) through (E). Unit equipment in accordance with 700.12(F) shall satisfy the applicable requirements of this article.

In selecting an emergency source of power, consideration shall be given to the occupancy and the type of service to be rendered, whether of minimum duration, as for evacuation of a theater, or longer duration, as for supplying emergency power and lighting due to an indefinite period of current failure from trouble either inside or outside the building.

Equipment shall be designed and located so as to minimize the hazards that might cause complete failure due to flooding, fires, icing, and vandalism.

Equipment for sources of power as described in 700.12(A) through (E) shall be installed either in spaces fully protected by approved automatic fire suppression systems (sprinklers, carbon dioxide systems, and so forth) or in spaces with a 1-hour fire rating where located within the following:

(1) Assembly occupancies for more than 1000 persons

(2) Buildings above 23 m (75 ft) in height with any of the following occupancy classes — assembly, educational, residential, detention and correctional, business, and mercantile

(3) Health care occupancies where persons are not capable of self-preservation

(4) Educational occupancies with more than 300 occupants

Informational Note No. 1: For the definition of *Occupancy Classification*, see Section 6.1 of NFPA *101*-2015, *Life Safety Code*.

Informational Note No. 2: For further information, see ANSI/IEEE 493-2007, *Recommended Practice for the Design of Reliable Industrial and Commercial Power Systems*.

Informational Note No. 3: See NFPA 110 Standard for Emergency and Standby Power Systems for information about additional energy sources that may be used for emergency power.

Statement of Problem and Substantiation for Public Input

According to a long-standing provision in NFPA 110, Section 5.1 permits the use of a public utility for an emergency power system. For the convenience of the committee, reproduced below is the relevant section of NFPA 110:

...."5.1.3* A public electric utility that has a demonstrated reliability shall be permitted to be used as the EPS where the primary source is by means of on-site energy conversion."...

This possibility makes safe and economical sense for large multi-building campuses with their own district energy system that provides power reliable enough for the AHJ to identify it as the primary source. Therefore the utility on the periphery, contingent upon availability of supply circuits and local tariffs, may provide emergency power. The safety and economic advantages of this are substantial because it can reduce the number of on-site generators on the periphery of the campus with district energy power. It also reduces carbon footprint; a high priority in the education industry sustainability agenda.

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Submittal Date: Thu Sep 07 13:57:24 EDT 2017

Copyright Assignment

Public Input No. 374-NFPA 70-2017 [Section No. 700.12(B)(1)]

(1) Prime Mover-Driven.

For a generator set driven by a prime ~~mover acceptable to the~~ mover approved by the authority having jurisdiction and sized in accordance with 700.4, means shall be provided for automatically starting the prime mover on failure of the normal service and for automatic transfer and operation of all required electrical circuits. A time-delay feature permitting a 15-minute setting shall be provided to avoid retransfer in case of short-time reestablishment of the normal source.

Statement of Problem and Substantiation for Public Input

This change is not a technical change. It is intended to be editorial only. This revision is merely an attempt to provide consistent terminology throughout the code. I believe the better word to use in this instance is the term "approved" since it is defined in Article 100 and used throughout the code and generally understood by installers and inspectors alike.

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Public Input No. 3159-NFPA 70-2017 [Section No. 700.12(B)(2)]

(2) Internal Combustion Engines as Prime Movers.

Where internal combustion engines are used as the prime mover, ~~an on-site fuel supply shall be provided with an on-premises fuel supply sufficient for not less than 2 hours' full-demand operation of the system~~ see NFPA 110, chapter 4 and 5 clause 5.1 and 5.6 for permitted energy sources (fuel supplies) and minimum hours of operation . Where power is needed for the operation of the fuel transfer pumps to deliver fuel to a generator set day tank, this pump shall be connected to the emergency power system.

Additional Proposed Changes

File Name	Description	Approved
NFPA_110_clause_5.1.PNG		✓
CSA_C282_clause_7.3.PNG		✓

Statement of Problem and Substantiation for Public Input

This change is necessary to eliminate a conflict between NFPA 70, clause 700.12 (B)(2) Internal combustion engines as Prime Movers requirements and the information provided in NFPA 110, clause 5.1 Energy Sources. NFPA 110 clause 5.1 states that the following energy sources can be used: 1) Liquid Petroleum at atmospheric pressure ...., 2) Liquefied petroleum gas (liquid or vapor withdrawal) as specified in the appropriate ASTM standards..... or 3) Natural or synthetic gas. See attached graphics file.

As a reference, CSA standard C282-15 allows for an off-site fuel supply only for emergency sources if the AHJ determines the off-site fuel supply is reliable. The relevant clause is CSA C282, 7.3-Fuel Supply states; "7.3.3 Off-site fuel supply, states in part "... when it can be demonstrated to the AHJ that the reliability of the off-site fuel supply and the associated piping meets the requirements of Clause 7.3.1 for a continuous fuel supply, on-site storage might not be required. This is an indication that this change is currently being accepted in the marketplace. See attached graphics file.

Also reference the submitted technical article from GTI for additional information on the reliability of the natural gas supply in the USA.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3160-NFPA 70-2017 [Section No. 700.12(B)(3)]	
Public Input No. 4151-NFPA 70-2017 [Section No. 701.12(B)(2)]	

Submitter Information Verification

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7.3 Fuel supply

7.3.1 Minimum quantity

A quantity of fuel sufficient for operating the engine under maximum site design load for at least 2 h shall be maintained on site at all times. The fuel supply shall be monitored with a local alarm indication and remote alarm annunciation in accordance with Table 1, and inspected in accordance with Table 2.

Note: *See Clause B.10 for commentary on this Clause.*

7.3.2 Health care facilities

In addition to Clause 7.3.1, where a generator set is required for emergency power supply to essential electrical systems in conformance with CSA Z32, a fuel supply shall be maintained on site at all times that is sufficient for operating the engine under full load for at least

a) 24 h for Class B and C facilities; and

b) 72 h for a Class A facility.

7.3.3 Off-site fuel supply

Notwithstanding Clause 7.3.1, when it can be demonstrated to the authority having jurisdiction that the reliability of the off-site utility fuel supply and the associated piping meets the requirements of Clause 7.3.1 for a continuous fuel supply, on-site storage might not be required.

Note: *See Clause B.11 for commentary on this Clause.*

Chapter 5 Emergency Power Supply (EPS): Energy Sources, Converters, and Accessories

5.1 Energy Sources.

5.1.1* The following energy sources shall be permitted to be used for the emergency power supply (EPS):

(1)* Liquid petroleum products at atmospheric pressure as specified in the appropriate ASTM standards and as recommended by the engine manufacturer
(2)* Liquefied petroleum gas (liquid or vapor withdrawal) as specified in the appropriate ASTM standards and as recommended by the engine manufacturer
(3)* Natural or synthetic gas

Public Input No. 3160-NFPA 70-2017 [Section No. 700.12(B)(3)]

~~**(3)** Dual Supplies.~~

~~Prime movers shall not be solely dependent on a public utility gas system for their fuel supply or municipal water supply for their cooling systems. Means shall be provided for automatically transferring from one fuel supply to another where dual fuel supplies are used.~~

~~*Exception: Where acceptable to the authority having jurisdiction, the use of other than on-site fuels shall be permitted where there is a low probability of a simultaneous failure of both the off-site fuel delivery system and power from the outside electrical utility company.*~~

Statement of Problem and Substantiation for Public Input

It is necessary to delete this section for the changes made in 700.12(B)(2) to not conflict with it.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 4155-NFPA 70-2017 [Section No. 701.12(B)(3)]	Similar change in a different clause
Public Input No. 3159-NFPA 70-2017 [Section No. 700.12(B)(2)]	Related change

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Public Input No. 375-NFPA 70-2017 [Section No. 700.12(B)(3)]

(3) Dual Supplies.

Prime movers shall not be solely dependent on a public utility gas system for their fuel supply or municipal water supply for their cooling systems. Means shall be provided for automatically transferring from one fuel supply to another where dual fuel supplies are used.

Exception: ~~Where acceptable to the~~ Where approved by the authority having jurisdiction, the use of other than on-site fuels shall be permitted where there is a low probability of a simultaneous failure of both the off-site fuel delivery system and power from the outside electrical utility company.

Statement of Problem and Substantiation for Public Input

This change is not a technical change. It is intended to be editorial only. This revision is merely an attempt to provide consistent terminology throughout the code. I believe the better word to use in this instance is the term “approved” since it is defined in Article 100 and used throughout the code and generally understood by installers and inspectors alike.

Submitter Information Verification

Submitter Full Name: Russ Leblanc
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Submittal Date: Sun Mar 26 08:46:15 EDT 2017

Public Input No. 2526-NFPA 70-2017 [Section No. 700.12(F)(2)]

(2) Installation of Unit Equipment.

Unit equipment shall be installed in accordance with 700.12(F)(2)(1) through (6).

(1) The batteries shall be of suitable rating and capacity to supply and maintain the total lamp load associated with the unit in accordance with (a) or (b):

(a) For a period of at least 1½ hours without the voltage falling below 87½ percent of normal battery voltage

(b) The unit equipment shall supply and maintain not less than 60 percent of the initial emergency illumination for a period of at least 1½ hours

(2) Unit equipment shall be permanently fixed (i.e., not portable) in place and shall have all wiring to each unit installed in accordance with the requirements of any of the wiring methods in Chapter 3. Flexible cord-and-plug connection shall be permitted, provided that the cord does not exceed 900 mm (3 ft) in length.

(3) The branch circuit feeding the unit equipment shall be the same branch circuit as that serving the normal lighting in the area and connected ahead of any local switches.

Exception: In a separate and uninterrupted area supplied by a minimum of three normal lighting circuits

~~that are not part of a multiwire branch circuit~~

, a separate branch circuit for unit equipment shall be permitted if it originates from the same panelboard as that of the normal lighting circuits and is provided with a lock-on feature.

(4) The branch circuit that feeds unit equipment shall be clearly identified at the distribution panel.

(5) Emergency luminaires that obtain power from a unit equipment and are not part of the unit equipment shall be wired to the unit equipment as required by 700.10 and by one of the wiring methods of Chapter 3.

(6) Remote heads providing lighting for the exterior of an exit door shall be permitted to be supplied by the unit equipment serving the area immediately inside the exit door.

Statement of Problem and Substantiation for Public Input

For new installations, 700.19 already requires that multi-wire branch circuits are not allowed for emergency lighting. For installations of emergency lighting in existing buildings, multi-wire branch circuits may have been used for the lighting in the room. In this case, 700.12(F) does not allow emergency lighting installations in existing buildings. Deleting "...that are not part of a multi-wire branch circuit" from the exception changes nothing for new installations but allows emergency lighting to be installed in existing buildings where multi-wire branch circuits were used.

Submitter Information Verification

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Affilliation: Self

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Public Input No. 655-NFPA 70-2017 [Section No. 700.12(F)(2)]

(2) Installation of Unit Equipment.

Unit equipment shall be installed in accordance with 700.12(F)(2)(1) through (6).

(1) The batteries shall be of suitable rating and capacity to supply and maintain the total lamp load associated with the unit in accordance with (a) or (b):

(a) For a period of at least 1½ hours without the voltage falling below 87½ percent of normal battery voltage

(b) The unit equipment shall supply and maintain not less than 60 percent of the initial emergency illumination for a period of at least 1½ hours

(2) Unit equipment shall be permanently fixed (i.e., not portable) in place and shall have all wiring to each unit installed in accordance with the requirements of any of the wiring methods in Chapter 3. Flexible cord-and-plug connection shall be permitted, provided that the cord does not exceed 900 mm (3 ft) in length.

(3) The branch circuit feeding the unit equipment shall be the same branch circuit as that serving the normal lighting in the area and connected ahead of any local switches.

Exception No. 1 : In a separate and uninterrupted area supplied by a minimum of three normal lighting circuits that are not part of a multiwire branch circuit, a separate branch circuit for unit equipment shall be permitted if it originates from the same panelboard as that of the normal lighting circuits and is provided with a lock-on feature.

Exception No. 2: In a separate and uninterrupted area supplied by at least one LED luminaire lighting circuit that is not part of a multiwire branch circuit, a separate branch circuit for unit equipment shall be permitted if it originates from the same panelboard as that of the LED luminaire lighting circuit(s) and is provided with a lock-on feature.

(4) The branch circuit that feeds unit equipment shall be clearly identified at the distribution panel.

(5) Emergency luminaires that obtain power from a unit equipment and are not part of the unit equipment shall be wired to the unit equipment as required by 700.10 and by one of the wiring methods of Chapter 3.

(6) Remote heads providing lighting for the exterior of an exit door shall be permitted to be supplied by the unit equipment serving the area immediately inside the exit door.

Statement of Problem and Substantiation for Public Input

With the advent of LED energy-efficient lighting, we may not need three circuits. I can envision a large room of cubicles, lit by one LED lighting circuit. When that code section was originally written, we did not have the LED boom that we have today. It is almost becoming the industry standard.

Exception No. 1 is the exception that is there now (unchanged).
Exception No. 2 is the same thing, but allows one circuit composed solely of LED luminaires.

I think it makes sense. In the event that the CMP does not agree, then I would emplore you to change the Exception No. 2 language to "a minimum of two LED lighting circuits that are not part of a multiwire branch circuit, etc...." rather than toss it out. Thanks.

Submitter Information Verification

Submitter Full Name: Nick Sasso

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Public Input No. 874-NFPA 70-2017 [Section No. 700.12(F)(2)]

<u>**(2)**</u> Installation of Unit Equipment.

Unit equipment shall be installed in accordance with 700.12(F)(2)(1) through (6).

(1) The batteries shall be of suitable rating and capacity to supply and maintain the total lamp load associated with the unit in accordance with (a) or (b):

(a) For a period of at least 1½ hours without the voltage falling below 87½ percent of normal battery voltage

(b) The unit equipment shall supply and maintain not less than 60 percent of the initial emergency illumination for a period of at least 1½ hours

(2) Unit equipment shall be permanently fixed (i.e., not portable) in place and shall have all wiring to each unit installed in accordance with the requirements of any of the wiring methods in Chapter 3. Flexible cord-and-plug connection shall be permitted, provided that the cord does not exceed 900 mm (3 ft) in length.

(3) The branch circuit feeding the unit equipment shall be the same branch circuit as that serving the normal lighting in the area and connected ahead of any local switches<u>, but shall also have switches available in a separate panel labeled "Emergency Lighting Panel" that shall contain separate switches with a "lock-on" feature for funcional testing of the batteries on the units</u> .<u>They shall also be labeled to indicate the locations of the units.</u>

<u>*Exception: In a separate and uninterrupted area supplied by a minimum of three normal lighting circuits that are not part of a multiwire branch circuit, a separate branch circuit for unit equipment shall be permitted if it originates from the same panelboard as that of the normal lighting circuits and is provided with a lock-on feature.*</u>

(4) The branch circuit that feeds unit equipment shall be clearly identified at the distribution panel.

(5) Emergency luminaires that obtain power from a unit equipment and are not part of the unit equipment shall be wired to the unit equipment as required by 700.10 and by one of the wiring methods of Chapter 3.

(6) Remote heads providing lighting for the exterior of an exit door shall be permitted to be supplied by the unit equipment serving the area immediately inside the exit door.

Additional Proposed Changes

File Name	Description	Approved
.1496181546270		✓

Statement of Problem and Substantiation for Public Input

Making it more simplified for the building engineer to perform a functional test as required and replace the batteries as needed and not as required after an inspection is performed by the fire service. This would allow the building owner/tenant to spread the cost of replacing the batteries and/or units as needed versus a larger expense at once after an inspection.

Submitter Information Verification

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State:

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Submittal Date: Tue May 30 17:48:33 EDT 2017

Public Input No. 586-NFPA 70-2017 [Section No. 700.15]

~~**700.15** Loads on Emergency Branch Circuits.~~

~~No appliances and no lamps, other than those specified as required for emergency use, shall be supplied by emergency lighting circuits.~~

Statement of Problem and Substantiation for Public Input

This is a companion public input to the one associated with revisions to section 700.17. The original 700.15 provided code requirements for branch circuits for emergency lighting. It would be more clear to relocate this information to the same section that covers this information.

Submitter Information Verification

Submitter Full Name: David Hittinger

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Submittal Date: Sun Apr 23 21:00:45 EDT 2017

Public Input No. 1868-NFPA 70-2017 [Section No. 700.16]

700.16 Emergency Illumination.

(A) General . Emergency illumination shall include means of egress lighting, illuminated exit signs, and all other luminaires specified as necessary to provide required illumination.

(B) System Reliability. Emergency lighting systems shall be designed and installed so that the failure of any individual ~~lighting~~ element, ~~such as~~ including but not limited to the burning out of a lamp, the failure of en emergency luminaire, or the failure of a control system element, cannot leave in total darkness any space that requires emergency illumination.

(C) Discharge Lighting. Where high-intensity discharge lighting such as high- and low-pressure sodium, mercury vapor, and metal halide is used as the sole source of normal illumination, the emergency lighting system shall be required to operate until normal illumination has been restored.

(D) Disconnecting Means. Where an emergency system is installed, emergency illumination shall be provided in the area of the disconnecting means required by 225.31 and 230.70, as applicable, where the disconnecting means are installed indoors.

Exception: Alternative means that ensure that the emergency lighting illumination level is maintained shall be permitted.

Statement of Problem and Substantiation for Public Input

As emergency lighting systems have expanded far beyond simple unit equipment, there are now many different types of emergency equipment that must function in order to get emergency lighting turned on in the event of a failure of normal power. The existing text of 700.16 makes it clear that the failure of a “single element” cannot leave a space in darkness, but the example of the “single element” as a burned out lamp does not adequately cover the intent for assured reliability of a modern emergency lighting system. These systems may now contain complex data network switches, intelligent luminaires, automatic load control relays, branch circuit emergency lighting transfer switches, and others—all of which may be in the chain of control required to energize emergency lighting. The product standard that covers many of these devices is UL924. The devices themselves cover a wide range of complexity, size, cost, and installation requirements. It is clear that an emergency lighting system must have sufficient reliability so that it “cannot leave in total darkness any space that requires emergency illumination.” However, it is not practical to guarantee such reliability in each and every device (including both software and hardware) that makes up the emergency system. The solution to this problem is to achieve such reliability at a system level via the wording of this proposal.

Submitter Information Verification

Submitter Full Name:	Steven Terry
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Affilliation:	US Institute for Theatre Technology
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Submittal Date:	Mon Aug 07 16:07:17 EDT 2017

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Public Input No. 1879-NFPA 70-2017 [Section No. 700.16]

700.16 Emergency Illumination.

Emergency illumination shall include means of egress lighting, illuminated exit signs, and all other luminaires specified as necessary to provide required illumination.

Emergency lighting systems shall be designed and installed so that the failure of any individual lighting element, such as the burning out of a lamp, or a LED driver, cannot leave in total darkness any space that requires emergency illumination.

Where high-intensity discharge lighting such as high- and low-pressure sodium, mercury vapor, and metal halide is used as the sole source of normal illumination, the emergency lighting system shall be required to operate until normal illumination has been restored.

Where an emergency system is installed, emergency illumination shall be provided in the area of the disconnecting means required by 225.31 and 230.70, as applicable, where the disconnecting means are installed indoors.

Exception: Alternative means that ensure that the emergency lighting illumination level is maintained shall be permitted.

Statement of Problem and Substantiation for Public Input

A single LED driver if burnt out could leave the area in total darkness, just like a element of a light bulb

Submitter Information Verification

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Submittal Date: Mon Aug 07 19:00:36 EDT 2017

Public Input No. 2201-NFPA 70-2017 [Section No. 700.16]

700.16 Emergency Illumination.

Emergency illumination shall include means of egress lighting, illuminated exit signs, and all other luminaires specified as necessary to provide required illumination.

Emergency lighting systems shall be designed and installed so that the failure of any individual ~~lighting element~~ lamp , such as the ~~burning out of a lamp, cannot~~ failure of an element or l.E.D. cannot leave in total darkness any space that requires emergency illumination.

Where high-intensity discharge lighting such as high- and low-pressure sodium, mercury vapor, and metal halide is used as the sole source of normal illumination, the emergency lighting system shall be required to operate until normal illumination has been restored.

Where an emergency system is installed, emergency illumination shall be provided in the area of the disconnecting means required by 225.31 and 230.70, as applicable, where the disconnecting means are installed indoors.

Exception: Alternative means that ensure that the emergency lighting illumination level is maintained shall be permitted.

Statement of Problem and Substantiation for Public Input

The text of section 700.16 addresses only the burning out of an element. Elements are typically associated with incandescent type lighting. An L.E.D. does not contain an "element" . The object seems to be that multiple lamps , whether incandescent or otherwise be utilized to protect from the failure of the failure of a simple lamp rendering the entire egress unit inoperative.

Submitter Information Verification

Submitter Full Name: David Humphrey

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Submittal Date: Tue Aug 15 09:08:07 EDT 2017

Public Input No. 3231-NFPA 70-2017 [Section No. 700.16]

700.16 Emergency Illumination.

Emergency illumination shall include means of egress lighting, illuminated exit signs, and all other luminaires specified as necessary to provide required illumination.

Informational note: Means of egress lighting includes lighting installed to illuminate the means of egress under normal power conditions and when normal power has been interrupted. For further information on the means of egress, see NFPA 101-2015, *Life Safety Code* and NFPA 1-2015, *Fire Code* .

Emergency lighting systems shall be designed and installed so that the failure of ~~any individual lighting element, such as the burning out of a~~ an individual lamp, cannot leave in total darkness any space that requires emergency illumination.

Where high-intensity discharge lighting such as high- and low-pressure sodium, mercury vapor, and metal halide is used as the sole source of normal illumination, the emergency lighting system shall be required to operate until normal illumination has been restored.

Where an emergency system is installed, emergency illumination shall be provided in the area of the disconnecting means required by 225.31 and 230.70, as applicable, where the disconnecting means are installed indoors.

Exception: Alternative means that ensure that the emergency lighting illumination level is maintained shall be permitted.

Statement of Problem and Substantiation for Public Input

Many code readers consider the term "emergency illumination" as applicable only to unit equipment designed to illuminate when normal power has been disrupted and do not understand that means of egress lighting also includes luminaires installed to illuminate the means of egress under normal power conditions. There is currently no definition of the "means of egress" in the NEC and no language in Article 700 pointing the code reader in the direction of additional resources. In addition, the NEC does not specify all locations where emergency illumination is "required".
The revised text that occurred in 700.16 during the 2017 code cycle warrants the need for further explanation so that readers are clear on additional documents with requirements on means of egress illumination.

The suggested change regarding the number of lamps will clear up the intent of the second paragraph in the code section.The original code language introduced in the 1950's intended to address the short life of a common incandescent light bulb. Many jurisdictions currently interpret the code language to apply to multi-bulb LED emergency luminaires that contain only one driver powering all lamps. It is becoming quite common to see an AHJ require two individual emergency luminaires serving the discharge side of an exit door so that the failure of one LED driver does not cause a space to be in total darkness. The failure of an LED driver or a fluorescent luminaire ballast are not near as common as replacing an incandescent light bulb.

Submitter Information Verification

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Public Input No. 1175-NFPA 70-2017 [Section No. 700.17]

700.17 Branch Circuits for Emergency Lighting.

Branch circuits from the emergency source and from the normal source shall be install within a metal raceway, or type MC cable. Branch circuits that supply emergency lighting shall be installed to provide service from a source complying with 700.12 when the normal supply for lighting is interrupted. Such installations shall provide either of the following:

(1) An emergency lighting supply, independent of the normal lighting supply, with provisions for automatically transferring the emergency lights upon the event of failure of the normal lighting branch circuit

(2) Two or more branch circuits supplied from separate and complete systems with independent power sources. One of the two power sources and systems shall be part of the emergency system, and the other shall be permitted to be part of the normal power source and system. Each system shall provide sufficient power for emergency lighting purposes.

Unless both systems are used for regular lighting purposes and are both kept lighted, means shall be provided for automatically energizing either system upon failure of the other. Either or both systems shall be permitted to be a part of the general lighting of the protected occupancy if circuits supplying lights for emergency illumination are installed in accordance with other sections of this article.

Statement of Problem and Substantiation for Public Input

In a multifamily building NM cable could be installed above dropped ceiling or above sheetrock for emergency circuits and normal source circuits for emergency lighting and exits in hallways and stair cases. These NM cable should not be installed for emergency circuits due to the toxic fumes given off from the NM cables in the exit hallways and stair cases. NM cable is not allowed in 518 of the NEC and in section 300.22(B) also due to the toxic fumes and physical damage. I would think that a multifamily building of 4 floors with 100 or so units, 25 on each floor through a long hallway 100 to 200 feet long with a dropped ceiling in the hallway and staircase with NM installed for emergency circuits could get damaged by fire or heat and would leave the hallway and stair cases in total darkness. Once the fire trips the normal power source or is turned of by the utility , the emergency source under 700 would also burn through before the occupants leave the building.

The hallway and staircase with the toxic fumes of the NM could effect the safe passage of the people in the building. The emergency system should be protected by heat, flame, or physical damage.

Getting people out of the building should be the most important part of the building construction and design.

Emergency system branch circuits should be identified every 10 feet and at every junction box, by painting conduits or fitting or tagging of the MC with tape.

Submitter Information Verification

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Submittal Date:	Tue Jul 18 10:43:33 EDT 2017

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Public Input No. 585-NFPA 70-2017 [Section No. 700.17]

700.17 Branch Circuits for Emergency Lighting.

(A) General.

Branch circuits that supply emergency lighting shall be installed to provide service from a source complying with 700.12 when the normal supply for lighting is interrupted. Such installations shall provide either of the following:

(1) An emergency lighting supply, independent of the normal lighting supply, with provisions for automatically transferring the emergency lights upon the event of failure of the normal lighting branch circuit

(2) Two or more branch circuits supplied from separate and complete systems with independent power sources. One of the two power sources and systems shall be part of the emergency system, and the other shall be permitted to be part of the normal power source and system. Each system shall provide sufficient power for emergency lighting purposes.

Unless both systems are used for regular lighting purposes and are both kept lighted, means shall be provided for automatically energizing either system upon failure of the other. Either or both systems shall be permitted to be a part of the general lighting of the protected occupancy if circuits supplying lights for emergency illumination are installed in accordance with other sections of this article.

(B) Non-emergency Lighting Loads.

No appliance loads, and no other lamps, other than those specified as required for emergency use, shall be supplied by emergency lighting branch circuits.

Statement of Problem and Substantiation for Public Input

Section 700.15 covers Loads on Emergency Branch circuits but if you read closely this section pertains to what cannot be installed on emergency branch lighting circuits. This public input relocates the information in 700.15 into 700.17 which deals with all requirements for emergency branch circuit lighting. A companion public input deletes section 700.15.

Submitter Information Verification

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Public Input No. 51-NFPA 70-2017 [New Section after 700.20]

TITLE OF NEW CONTENT

Controls utilizing motion sensors, automatic means or energy management systems shall not be used.

Statement of Problem and Substantiation for Public Input

Extra care must be taken to ensure the reliability of Emergency Systems and their control. Providing direction to installers and designers to ensure and verify that Emergency Lighting circuits shall not be controlled or interrupted by motion sensors, automatic means or energy management systems is just as important as ensuring that they are not connected to other types of switches such as 3- and 4- ways as required in the current text. Modern construction and use of the energy conservation codes frequently requires the use of controls utilizing motion sensors, automatic means or energy management systems. It is imperative that Emergency Lighting operation not be interrupted by such systems.

Submitter Information Verification

Submitter Full Name: Michael Farrell III
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Submittal Date: Wed Jan 25 20:08:28 EST 2017

Public Input No. 1872-NFPA 70-2017 [Section No. 700.23]

700.23 Dimmer and Relay Systems.

A dimmer or relay system containing more than one dimmer or relay and listed for use in emergency systems shall be permitted to be used as a control device for energizing emergency lighting circuits. Upon failure of normal power, the dimmer or relay system shall be permitted to selectively energize only those branch circuits required to provide minimum emergency illumination <u>using a control bypass function</u> . <u>Where the dimmer or relay system is fed by a normal/emergency source from an upstream transfer switch, normal power sensing for this function shall be permittted to be from a normal-only power source upstream of the transfer switch.</u> All branch circuits supplied by the dimmer or relay system cabinet shall comply with the wiring methods of Article 700.

Statement of Problem and Substantiation for Public Input

When a UL924-listed dimmer or relay system is installed in compliance with 700.23, it is often fed from a normal/emergency source via an upstream UL1008 transfer switch. When normal power fails, the entire feed to the dimmer or relay panel is transferred. As such, the dimmer or relay panel must monitor a normal-only source other than its own normal/emergency feed in order to determine whether it is operating on normal or emergency power, and whether a bypass of control function is required.

This has created confusion with the requirement of 700.17 (1) which implies that normal power sensing must be from the normal branch circuit feeding a normal/emergency load.

Submitter Information Verification

Submitter Full Name: Steven Terry
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Street Address:
City:
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Submittal Date: Mon Aug 07 16:22:20 EDT 2017

Public Input No. 1635-NFPA 70-2017 [Section No. 700.24]

700.24 Directly Controlled Emergency Luminaires.

Where emergency illumination is provided by one or more directly controlled emergency luminaires that respond to an external control input to bypass normal control upon loss of normal power, such luminaires and external bypass controls shall be individually listed for use in emergency systems.

Statement of Problem and Substantiation for Public Input

Revision in language to coordinate with corrected definition under separate proposal. Not all Directly Controlled luminaires are used for emergency lighting.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 1634-NFPA 70-2017 [Definition: Luminaire, Directly Controlled.]	Revised definition of directly controlled luminaire

Submitter Information Verification

Submitter Full Name: Steven Terry

Organization: Electronic Theatre Controls Inc

Affilliation: US Institute for Theatre Technology

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Submittal Date: Wed Aug 02 15:56:23 EDT 2017

Public Input No. 3710-NFPA 70-2017 [Section No. 700.31]

700.31 Ground-Fault Protection of Equipment.

The alternate source for emergency systems shall not ~~be required to~~ provide ground-fault protection of equipment with automatic disconnecting means. Ground-fault indication at the emergency source shall be provided in accordance with 700.6(D) ~~if ground-fault protection of equipment with automatic disconnecting means is not provided~~ .

Statement of Problem and Substantiation for Public Input

The existing language permits GFP protection with automatic disconnecting means to be installed on our emergency systems. In the event of a ground fault on the normal system, which causes the normal power main to open, when the Article 700 system comes on line the same fault will cause it to go down, losing all power. Our emergency systems are our life safety systems electrically. We should design our emergency systems to function with similar dependability to what we require for our fire pumps. Ground fault detection will ensure that even though we have a ground fault the system will operate and provide the power needed in the event of an emergency.

I am aware of a hospital that has GFP on the entire emergency system. This provides a safety issue for the occupants of that facility.

This change will insure we have emergency systems that will function when needed.

Submitter Information Verification

Submitter Full Name: Randal Hunter
Organization: HTS
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Submittal Date: Wed Sep 06 17:59:06 EDT 2017

Public Input No. 1932-NFPA 70-2017 [Section No. 700.32]

700.32 Selective Coordination.

Emergency system(s) overcurrent protective devices shall be selectively coordinated with all supply-side overcurrent protective devices.

Selective coordination shall be selected by a licensed professional engineer or other qualified persons engaged primarily in the design, installation, or maintenance of electrical systems. The selection shall be documented and made available to those authorized to design, install, inspect, maintain, and operate the system.

Exception ~~: Selective coordination shall not be required between two overcurrent devices located in series if no loads are connected in parallel with the downstream device~~ No. 1: Between transformer primary and secondary overcurrent protective devices, where only one overcurrent protective device or set of overcurrent protective devices exists on the transformer secondary.

Exception No. 2: Between overcurrent protective devices of the same size (ampere rating) in series .

Statement of Problem and Substantiation for Public Input

There are two conditions where selective coordination is not possible, overcurrent devices in series and overcurrent devices on the primary and the secondary of a transformer. As currently worded, the exception does not specifically address both these conditions. This proposed revision addresses both conditions (two overcurrent devices in series and overcurrent devices on the primary and secondary of a transformer) and provides clear language for both conditions.

In addition, the proposed language in the exceptions matches the language currently found in the exceptions of NEC 517.32(G) which will provide consistency between these two sections of the NEC. In an attempt to achieve consistency between all NEC sections that require selective coordination, similar revisions will be proposed for the following sections:

NEC 620.62
NEC 645.27
NEC 695.3(C)(3)
NEC 701.27
NEC 708.54

Submitter Information Verification

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Submittal Date:	Tue Aug 08 23:22:17 EDT 2017

Copyright Assignment

I, Phillip Whisenhunt, 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 Phillip Whisenhunt, 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. 3452-NFPA 70-2017 [Section No. 700.32]

700.32 Selective Coordination.

Emergency system(s) overcurrent devices shall be selectively coordinated with all supply-side overcurrent protective devices.

Selective coordination shall be selected by a licensed professional engineer or other qualified persons engaged primarily in the design, installation, or maintenance of electrical systems. Devices used for the selective coordination with adjustable settings shall have those settings adjusted and verified to insure proper coordination. The selection and device settings shall be documented and made available to those authorized to design, install, inspect, maintain, and operate the system.

Exception: Selective coordination shall not be required between two overcurrent devices located in series if no loads are connected in parallel with the downstream device.

Statement of Problem and Substantiation for Public Input

A high percentage of systems designed for selective coordination utilize devices that have adjustable features. Many of these require electronic devices to setup and adjust. These adjustments must be performed to insure they will function to achieve the desired coordination. Often adjustable settings leave the factory set at minimums, in the design of selective coordination the settings must be adjusted in relationship to the other devices used within the system.

This added language will complete this concept, insuring that not only do we have a design and equipment installed that is capable of coordination, but that it is properly adjusted to function as intended by the design professional. The documentation will provide the AHJ the needed verification for the project that not only is it installed but that it has been adjusted to perform the required coordination. This is basically a life safety issue that should not be taken lightly.

This report also provides the owner the information required for proper maintenance and servicing especially if future modifications are performed to the project.

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Submittal Date: Wed Sep 06 10:11:51 EDT 2017

Public Input No. 3705-NFPA 70-2017 [Section No. 700.32]

700.32 Selective Coordination.

Emergency system(s) overcurrent devices shall be selectively coordinated with all supply-side overcurrent protective devices.

Selective coordination shall be selected by a licensed professional engineer or other qualified persons engaged primarily in the design, installation, or maintenance of electrical systems. Devices used for selective coordination with adjustable settings shall have those settings adjusted and verified prior to occupancy to insure proper coordination. The selection and device settings shall be documented and made available to those authorized to design, install, inspect, maintain, and operate the system.

Exception: Selective coordination shall not be required between two overcurrent devices located in series if no loads are connected in parallel with the downstream device.

Statement of Problem and Substantiation for Public Input

A high percentage of systems designed for selective coordination utilize devices that have adjustable features. Many of these require electronic devices to setup and adjust. These adjustments must be performed in order to insure that the protection will function to achieve the desired coordination. Often adjustable settings leave the factory set at minimums, in the design of selective coordination the settings must be adjusted in relationship to the other devices used within the system.

This added language will complete this concept, insuring that not only do we have a design and equipment installed that is capable of coordination, but that it is properly adjusted to function as intended by the design professional. The documentation will provide the AHJ the needed verification for the project that not only is it installed but that it has been adjusted to perform the required coordination. This is basically a life safety issue that should not be taken lightly.

This report also provides the owner the information required for proper maintenance and servicing especially if future modifications are made to the project.

We can have the best design, the best equipment made, and if it is not properly installed and adjusted it will never perform the desired selective coordination.

Submitter Information Verification

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Submittal Date: Wed Sep 06 17:42:48 EDT 2017

Public Input No. 4135-NFPA 70-2017 [Section No. 700.32]

700.32 Selective Coordination.

Emergency system(s) overcurrent devices shall be selectively coordinated with all supply-side overcurrent protective devices of the Emergency system .

Selective coordination shall be selected by a licensed professional engineer or other qualified persons engaged primarily in the design, installation, or maintenance of electrical systems. The selection shall be documented and made available to those authorized to design, install, inspect, maintain, and operate the system.

Exception: Selective coordination shall not be required between two overcurrent devices located in series if no loads are connected in parallel with the downstream device.

Statement of Problem and Substantiation for Public Input

There is confusion on what is meant by supply side and this will clarify the intent is for all on the supply side of the Emergency system. There is confusion on if the normal and emergency both need to comply so there needs to be a stand one way or another.

Submitter Information Verification

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Submittal Date: Thu Sep 07 15:02:28 EDT 2017

Public Input No. 4138-NFPA 70-2017 [Section No. 700.32]

700.32 Selective Coordination.

Emergency system(s) overcurrent devices shall be selectively coordinated with all supply-side overcurrent protective devices.

Selective coordination shall be selected by a licensed professional engineer or other qualified persons engaged primarily in the design, installation, or maintenance of electrical systems. The selection shall be documented and made available to those authorized to design, install, inspect, maintain, and operate the system.

Exception: Selective coordination shall not be required between two overcurrent devices located in series if no loads are connected in parallel with the downstream device.

Informational note: Supply side means all overcurrent devices on both the normal and emergency circuits.

Statement of Problem and Substantiation for Public Input

New Informational Note is to clarify that both the normal and emergency are meant to be included. There is confusion on if it just emergency side so there needs to be a stand one way or another.

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Submittal Date: Thu Sep 07 15:06:25 EDT 2017

Public Input No. 684-NFPA 70-2017 [Section No. 700.32]

700.32 Selective Coordination.

Emergency system(s) overcurrent devices shall be selectively coordinated with all supply-side overcurrent protective devices.

Selective coordination overcurrent protective devices shall be selected by a licensed professional engineer or other qualified persons engaged primarily in the design, installation, or maintenance of electrical systems. Adjustable settings for the overcurrent devices selected shall also be set by the licensed professional engineer or other qualified person prior to inspection. The selection ~~shall be documented and~~ and device settings shall be posted on the peice of equipment that contains the adjustable breaker. Documentaion of these settings shall also be made available to those authorized to design, install, inspect, maintain, and operate the system.

Exception: Selective coordination shall not be required between two overcurrent devices located in series if no loads are connected in parallel with the downstream device.

Statement of Problem and Substantiation for Public Input

This is a safety concern as well as a cost hardship. I can unequivocally tell CMP 13 that well over 50% of the the inspections I have performed have had the settings of the adjustable breakers not match the coordination study. I can also tell you with a degree of certainty that many AHJ's do not check this crucial part of the service inspection. Adding this sentence or something similar would be a great start. With the great cost in the design and the specialized breakers that have to occur to meet nec 700.32 it is all for nothing if the settings are not accurate. I tell you with certainty even after commissioning has been performed the settings are typically wrong. Often they are left at factory settings or random settings. I have seen the gamete. There is no direction in the NEC to who is responsible for this very important task. To meet the safeguarding purpose of the NEC this change would provide direction on who is responsible for the settings while instructing the AHJ to verify the settings match the study. Posting the settings only makes sense, especially with the allowance of readjusting the instantaneous settings to meet NEC 240.87
I recently was informed by a contractor that he was told to adjust the breakers in the middle of the settings or leave them at the factory settings. this area is in desperate need of guidance

Submitter Information Verification

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Submittal Date: Wed May 10 10:51:59 EDT 2017

Public Input No. 2736-NFPA 70-2017 [New Section after 700.32]

TITLE OF NEW CONTENT

Equipment enclosures for selectively coordinated overcurrent devices shall be legibly marked in the field to indicate the overcurrent devices are selectively coorindated, the marking shall meet the requirements in 110.21 (B) and shall be readily visible and state the following. CAUTION-OVERCURRENT DEVICE(S) ARE SELECTIVELY COORDINATED EXACT REPLACEMENT AND TRIP SETTINGS REQUIRED

Statement of Problem and Substantiation for Public Input

the field marking will alert those who are authorized to maintain, inspect or work on the system that the overcurrent devices are selectively coordinated. The field marking will clearly identify what overcurrent devices are selectively coordinated per the engineer documentation after final inspections and for future modifications to the system.

Submitter Information Verification

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Submittal Date: Fri Aug 25 13:53:01 EDT 2017

Public Input No. 294-NFPA 70-2017 [Part VI.]

Part VI. Overcurrent Protection Relocate this to Article 240.

Statement of Problem and Substantiation for Public Input

All overcurrent protection requirements should be consolidated in Article 240 for more convenient reading and to have all overcurrent protection under one code making panel.

Submitter Information Verification

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Submittal Date: Fri Feb 24 13:08:03 EST 2017

Public Input No. 2839-NFPA 70-2017 [New Section after 701.27]

TITLE OF NEW CONTENT

Equipment enclosures for selectively coordinated overcurrent devices shall be legibly marked in the field to indicate the overcurrent devices are selectively coordinated, the marking shall meet the requirements in 110.21 (B) and shall be readily visible and state the following. CAUTION-OVERCURRENT DEVICE (S) ARE SELECTEIVELY COORDINATED EXCACT REPLACEMENT AND TRIP SETTINGS REQUIRED

Statement of Problem and Substantiation for Public Input

The field markings will alert those who are authorized to maintain, inspect or work on the system that the overcurrent devices are selectively coordinated. The field marking will clearly identify what overcurrent devices are selectively coordinated per the engineer documentation after the final inspection and for future modifications to the system

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2736-NFPA 70-2017 [New Section after 700.32]	

Submitter Information Verification

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Submittal Date: Mon Aug 28 07:07:38 EDT 2017

Public Input No. 2233-NFPA 70-2017 [Section No. 701.2]

701.2 Definition. The definition in this section shall apply within this article and throughout the code.

Legally Required Standby Systems.

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

Informational Note: Legally required standby systems are typically installed to serve loads, such as heating and refrigeration systems, communications systems, ventilation and smoke removal systems, sewage disposal, lighting systems, and industrial processes, that, when stopped during any interruption of the normal electrical supply, could create hazards or hamper rescue or fire-fighting operations.

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

Related Public Inputs for This Document

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

Submitter Information Verification

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Submittal Date: Tue Aug 15 12:43:27 EDT 2017

Public Input No. 1289-NFPA 70-2017 [Section No. 701.4]

701.4 Capacity and Rating.

A legally required standby system shall have adequate capacity and rating for the supply of all equipment intended to be operated at one time. Legally required standby system equipment shall be suitable for the ~~maximum~~ available fault current at its terminals.

The legally required standby alternate power source shall be permitted to supply both legally required standby and optional standby system loads under either of the following conditions:

(1) Where the alternate source has adequate capacity to handle all connected loads

(2) Where automatic selective load pickup and load shedding is provided that will ensure adequate power to the legally required standby circuits

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. 1249-NFPA 70-2017 [Section No. 110.24(A)]	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. 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

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Submittal Date: Mon Jul 24 20:22:51 EDT 2017

Public Input No. 249-NFPA 70-2017 [Section No. 701.4]

701.4 Capacity and Rating.

A legally required standby system shall have adequate capacity and rating for the supply of all equipment ~~intended to be operated at one time. Legally~~ connected to the legally required system. The calculations of load on the legally required standby source shall be made in accordance with Article 220 or by another approved method. Legally required standby system equipment shall be suitable for the maximum available fault current at its terminals.

The legally required standby alternate power source shall be permitted to supply both legally required standby and optional standby system loads under either of the following conditions:

(1) Where the alternate source has adequate capacity to handle all connected loads

(2) Where automatic selective load pickup and load shedding is provided that will ensure adequate power to the legally required standby circuits

Statement of Problem and Substantiation for Public Input

Article 220 has purview over feeder load calculations. The current code language could be interpreted as requiring the legally required source to have a larger output rating than the ampacity rating of the normal power supply. The calculation for a feeder for a legally required panelboard that was sized in accordance with Article 220 should also be allowed to serve as the sizing calculation for the legally required source of power. A 400A normal power feeder installed to a transfer switch should be allowed to be protected by an legally required generator with a 400A output. By allowing other approved methods, the load calculation shall be permitted to be calculated under engineering supervision.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 248-NFPA 70-2017 [Section No. 700.4(A)]	The proposed changes reference Article 220 for sizing emergency/legally required sources of power

Submitter Information Verification

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Submittal Date: Thu Feb 16 10:56:02 EST 2017

Public Input No. 1881-NFPA 70-2017 [Section No. 701.5(A)]

(A) General.

Transfer equipment, including automatic transfer switches, shall be automatic and identified for emergency system or legally required standby use and approved by the authority having jurisdiction. Transfer equipment shall be designed and installed to prevent the inadvertent interconnection of normal and alternate sources of supply in any operation of the transfer equipment. Transfer equipment and electric power production systems installed to permit operation in parallel with the normal source shall meet the requirements of Article 705.

Statement of Problem and Substantiation for Public Input

The requirement to be identified for standby use is not restrictive enough, since there are transfer switches that are identified for optional standby use. Transfer switches used in legally required standby applications must be suitable for emergency or legally required standby applications, which requires compliance with more onerous requirements than transfer switches for optional standby use.

Submitter Information Verification

Submitter Full Name: Paul Barnhart
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Submittal Date: Mon Aug 07 21:29:30 EDT 2017

Public Input No. 3477-NFPA 70-2017 [Section No. 701.5(A)]

<u>(A)</u> General.

Transfer equipment, including automatic transfer switches, shall be automatic and identified for standby use and approved by the authority having jurisdiction. Transfer equipment shall be designed and installed to prevent the inadvertent interconnection of normal and alternate sources of supply in any operation of the transfer equipment. Transfer equipment and electric power production systems installed to permit operation in parallel with the normal source shall meet the requirements of Article 705. <u>Meter mounted transfer switches shall not be permitted for legally required system use.</u>

Statement of Problem and Substantiation for Public Input

This public input is one of four to address the use of meter mounted transfer switches. A public input has been submitted to 230.82 to recognize the use of these devices. A second public input has been submitted to permit these devices for manual use in optional standby systems. This public input is submitted to prohibit the use of meter mounted transfer switches in legally required systems.

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:
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Zip:
Submittal Date: Wed Sep 06 11:29:49 EDT 2017

Public Input No. 625-NFPA 70-2017 [Section No. 701.12]

701.12 General Requirements.

Current supply shall be such that, in the event of failure of the normal supply to, or within, the building or group of buildings concerned, legally required standby power will be available within the time required for the application but not to exceed 60 seconds. The supply system for legally required standby purposes, in addition to the normal services to the building, shall be permitted to comprise one or more of the types of systems described in 701.12(A) through (F). Unit equipment in accordance with 701.12(G) shall satisfy the applicable requirements of this article.

(A) Source Selection.

In selecting a legally required standby source of power, consideration shall be given to the type of service to be rendered, whether of short-time duration or long duration.

(B) Source Location.

Consideration shall be given to the location or design, or both, of all equipment to minimize the hazards that might cause complete failure due to floods, fires, icing, and vandalism.

Informational Note: For further information, see ANSI/IEEE 493-2007, *Recommended Practice for the Design of Reliable Industrial and Commercial Power Systems*.

701.13 Source Type.

(A) Storage Battery.

Storage batteries shall be of suitable rating and capacity to supply and maintain the total load for a minimum period of 1½ hours without the voltage applied to the load falling below 87½ percent of normal. Automotive-type batteries shall not be used.

An automatic battery charging means shall be provided.

(B) Generator Set.

(1) Prime Mover-Driven.

For a generator set driven by a prime mover acceptable to the authority having jurisdiction and sized in accordance with 701.4, means shall be provided for automatically starting the prime mover upon failure of the normal service and for automatic transfer and operation of all required electrical circuits. A time-delay feature permitting a 15-minute setting shall be provided to avoid retransfer in case of short-time re-establishment of the normal source.

(2) Internal Combustion Engines as Prime Mover.

Where internal combustion engines are used as the prime mover, an on-site fuel supply shall be provided with an on-premises fuel supply sufficient for not less than 2 hours of full-demand operation of the system. Where power is needed for the operation of the fuel transfer pumps to deliver fuel to a generator set day tank, the pumps shall be connected to the legally required standby power system.

(3) Dual Supplies.

Prime movers shall not be solely dependent on a public utility gas system for their fuel supply or on a municipal water supply for their cooling systems. Means shall be provided for automatically transferring one fuel supply to another where dual fuel supplies are used.

Exception: Where acceptable to the authority having jurisdiction, the use of other than on-site fuels shall be permitted where there is a low probability of a simultaneous failure of both the off-site fuel delivery system and power from the outside electrical utility company.

(4) Battery Power.

Where a storage battery is used for control or signal power or as the means of starting the prime mover, it shall be suitable for the purpose and shall be equipped with an automatic charging means independent of the generator set.

(5) Outdoor Generator Sets.

Where an outdoor housed generator set is equipped with a readily accessible disconnecting means in accordance with 445.18, and the disconnecting means is located within sight of the building or structure supplied, an additional disconnecting means shall not be required where ungrounded conductors serve or pass through the building or structure. Where the generator supply conductors terminate at a disconnecting means in or on a building or structure, the disconnecting means shall meet the requirements of 225.36.

(C) Uninterruptible Power Supplies.

Uninterruptible power supplies used to provide power for legally required standby systems shall comply with the applicable provisions of 701.12(A) and (B).

(D) Separate Service.

Where approved, a separate service shall be permitted as a legally required source of standby power. This service shall be in accordance with the applicable provisions of Article 230, with a separate service drop or lateral or a separate set of overhead or underground service conductors sufficiently remote electrically and physically from any other service to minimize the possibility of simultaneous interruption of supply from an occurrence in another service.

(E) Connection Ahead of Service Disconnecting Means.

Where acceptable to the authority having jurisdiction, connections located ahead of and not within the same cabinet, enclosure, vertical switchgear section, or vertical switchboard section as the service disconnecting means shall be permitted. The legally required standby service shall be sufficiently separated from the normal main service disconnecting means to minimize simultaneous interruption of supply through an occurrence within the building or groups of buildings served.

Informational Note: See 230.82 for equipment permitted on the supply side of a service disconnecting means.

(F) Fuel Cell System.

Fuel cell systems used as a source of power for legally required standby systems shall be of suitable rating and capacity to supply and maintain the total load for not less than 2 hours of full-demand operation.

Installation of a fuel cell system shall meet the requirements of Parts II through VIII of Article 692.

Where a single fuel cell system serves as the normal supply for the building or group of buildings concerned, it shall not serve as the sole source of power for the legally required standby system.

(G) Unit Equipment.

Individual unit equipment for legally required standby illumination shall consist of the following:

(1) A rechargeable battery

(2) A battery charging means

(3) Provisions for one or more lamps mounted on the equipment and shall be permitted to have terminals for remote lamps

(4) A relaying device arranged to energize the lamps automatically upon failure of the supply to the unit equipment

The batteries shall be of suitable rating and capacity to supply and maintain the total lamp load associated with the unit for not less than (a) or (b):

(a) For a period of 1½ hours, without the voltage falling below 87½ percent of normal voltage

(b) The unit equipment shall supply and maintain not less than 60 percent of the initial emergency illumination for a period of at least 1½ hours.

Unit equipment shall be permanently fixed in place (i.e., not portable) and shall have all wiring to each unit installed in accordance with the requirements of any of the wiring methods in Chapter 3. Flexible cord-and-plug connection shall be permitted, provided that the cord does not exceed 900 mm (3 ft) in length. The branch circuit feeding the unit equipment shall be the same branch circuit as that serving the normal lighting in the area and connected ahead of any local switches. Legally required standby luminaires that obtain power from a unit equipment and are not part of the unit equipment shall be wired to the unit equipment by one of the wiring methods of Chapter 3.

Exception: In a separate and uninterrupted area supplied by a minimum of three normal lighting circuits, a separate branch circuit for unit equipment shall be permitted if it originates from the same panelboard as that of the normal lighting circuits and is provided with a lock-on feature.

Statement of Problem and Substantiation for Public Input

The introductory paragraph to 701.12 is a rather lengthy. It would be more appropriate to subdivide this section into more first level subdivisions to provide additional clarity and usability. The proposed subdivisions include source location, source type, and source selection that will accomplish this revision.

A companion public input is submitted that makes similar editorial changes to 700.12.

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Submittal Date: Sat Apr 29 10:42:12 EDT 2017

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I, David Hittinger, 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 David Hittinger, 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. 377-NFPA 70-2017 [Section No. 701.12(B)(1)]

(1) Prime Mover-Driven.

For a generator set driven by a prime ~~mover acceptable to the~~ mover apoved by the authority having jurisdiction and sized in accordance with 701.4, means shall be provided for automatically starting the prime mover upon failure of the normal service and for automatic transfer and operation of all required electrical circuits. A time-delay feature permitting a 15-minute setting shall be provided to avoid retransfer in case of short-time re-establishment of the normal source.

Statement of Problem and Substantiation for Public Input

This change is not a technical change. It is intended to be editorial only. This revision is merely an attempt to provide consistent terminology throughout the code. I believe the better word to use in this instance is the term “approved” since it is defined in Article 100 and used throughout the code and generally understood by installers and inspectors alike.

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Submitter Full Name: Russ Leblanc

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Public Input No. 4151-NFPA 70-2017 [Section No. 701.12(B)(2)]

(2) Internal Combustion Engines as Prime Mover.

Where internal combustion engines are used as the prime mover, ~~an on-site fuel supply shall be provided with an on-premises fuel supply sufficient for not less than 2 hours of full-demand operation of the system~~ see NFPA 110, chapter 4 and 5 clause 5.1 and 5.6 for permitted energy sources (fuel supplies) and minimum hours of operation . Where power is needed for the operation of the fuel transfer pumps to deliver fuel to a generator set day tank, the pumps shall be connected to the legally required standby power system.

Additional Proposed Changes

File Name	Description	Approved
NFPA_110_clause_5.1.PNG		✓
CSA_C282_clause_7.3.PNG		✓

Statement of Problem and Substantiation for Public Input

This change is necessary to eliminate a conflict between NFPA 70, clause 701.12 (B)(2) Internal combustion engines as Prime Movers requirements and the information provided in NFPA 110, clause 5.1 Energy Sources. NFPA 110 clause 5.1 states that the following energy sources can be used: 1) Liquid Petroleum at atmospheric pressure ...., 2) Liquefied petroleum gas (liquid or vapor withdrawal) as specified in the appropriate ASTM standards..... or 3) Natural or synthetic gas. See attached graphics file.

As a reference, CSA standard C282-15 allows for an off-site fuel supply only for emergency sources if the AHJ determines the off-site fuel supply is reliable. The relevant clause is CSA C282, 7.3-Fuel Supply states; "7.3.3 Off-site fuel supply, states in part "... when it can be demonstrated to the AHJ that the reliability of the off-site fuel supply and the associated piping meets the requirements of Clause 7.3.1 for a continuous fuel supply, on-site storage might not be required. This is an indication that this change is currently being accepted in the marketplace. See attached graphics file.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 4155-NFPA 70-2017 [Section No. 701.12(B)(3)]	Related change
Public Input No. 3159-NFPA 70-2017 [Section No. 700.12(B)(2)]	Similar change different clause

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Chapter 5 Emergency Power Supply (EPS): Energy Sources, Converters, and Accessories

5.1 Energy Sources.

5.1.1* The following energy sources shall be permitted to be used for the emergency power supply (EPS):

(1)* Liquid petroleum products at atmospheric pressure as specified in the appropriate ASTM standards and as recommended by the engine manufacturer
(2)* Liquefied petroleum gas (liquid or vapor withdrawal) as specified in the appropriate ASTM standards and as recommended by the engine manufacturer
(3)* Natural or synthetic gas

7.3 Fuel supply

7.3.1 Minimum quantity

A quantity of fuel sufficient for operating the engine under maximum site design load for at least 2 h shall be maintained on site at all times. The fuel supply shall be monitored with a local alarm indication and remote alarm annunciation in accordance with Table 1, and inspected in accordance with Table 2.

Note: *See Clause B.10 for commentary on this Clause.*

7.3.2 Health care facilities

In addition to Clause 7.3.1, where a generator set is required for emergency power supply to essential electrical systems in conformance with CSA Z32, a fuel supply shall be maintained on site at all times that is sufficient for operating the engine under full load for at least

a) 24 h for Class B and C facilities; and

b) 72 h for a Class A facility.

7.3.3 Off-site fuel supply

Notwithstanding Clause 7.3.1, when it can be demonstrated to the authority having jurisdiction that the reliability of the off-site utility fuel supply and the associated piping meets the requirements of Clause 7.3.1 for a continuous fuel supply, on-site storage might not be required.

Note: *See Clause B.11 for commentary on this Clause.*

Public Input No. 379-NFPA 70-2017 [Section No. 701.12(B)(3)]

(3) Dual Supplies.

Prime movers shall not be solely dependent on a public utility gas system for their fuel supply or on a municipal water supply for their cooling systems. Means shall be provided for automatically transferring one fuel supply to another where dual fuel supplies are used.

Exception: ~~Where acceptable to the~~ Where approved by the authority having jurisdiction, the use of other than on-site fuels shall be permitted where there is a low probability of a simultaneous failure of both the off-site fuel delivery system and power from the outside electrical utility company.

Statement of Problem and Substantiation for Public Input

This change is not a technical change. It is intended to be editorial only. This revision is merely an attempt to provide consistent terminology throughout the code. I believe the better word to use in this instance is the term “approved” since it is defined in Article 100 and used throughout the code and generally understood by installers and inspectors alike.

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Public Input No. 4155-NFPA 70-2017 [Section No. 701.12(B)(3)]

~~**(3)** Dual Supplies.~~

~~Prime movers shall not be solely dependent on a public utility gas system for their fuel supply or on a municipal water supply for their cooling systems. Means shall be provided for automatically transferring one fuel supply to another where dual fuel supplies are used.~~

~~*Exception: Where acceptable to the authority having jurisdiction, the use of other than on-site fuels shall be permitted where there is a low probability of a simultaneous failure of both the off-site fuel delivery system and power from the outside electrical utility company.*~~

Statement of Problem and Substantiation for Public Input

It is necessary to delete this section for the changes made in 701.12(B)(2) so as not to conflict with it.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3160-NFPA 70-2017 [Section No. 700.12(B)(3)]	Similar change in a different section
Public Input No. 4151-NFPA 70-2017 [Section No. 701.12(B)(2)]	Related change

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Public Input No. 971-NFPA 70-2017 [Section No. 701.25]

701.~~25~~ 30 Accessibility.

The branch-circuit overcurrent devices in legally required standby circuits shall be accessible to authorized persons only.

Statement of Problem and Substantiation for Public Input

Improve NEC usability as recommended by the NEC Style Manual section 2.4.1 by using parallel numbering within similar Articles.
Related PIs 972 and 973

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 972-NFPA 70-2017 [Section No. 701.26]	
Public Input No. 973-NFPA 70-2017 [Section No. 701.27]	

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Public Input No. 3715-NFPA 70-2017 [Section No. 701.26]

701.26 Ground-Fault Protection of Equipment.

The alternate source for legally required standby systems shall not ~~be required to~~ provide ground-fault protection of equipment with automatic disconnecting means. Ground-fault indication at the legally required standby source shall be provided in accordance with 701.6(D) ~~if ground-fault protection of equipment with automatic disconnecting means is not provided~~ .

Statement of Problem and Substantiation for Public Input

The existing language permits GFP protection with automatic disconnecting means to be installed on our legally required systems. In the event of a ground fault on the normal system, which causes the normal power main to open, when the Article 701 system comes on line the same fault will cause it to go down, losing all power. Our legally required systems are part of our life safety systems electrically. We should design our emergency systems to function with similar dependability to that which we require on our fire pumps. Ground fault detection will ensure that even though we have a ground fault the system will operate to and provide the power needed in the event of an emergency.

I am aware of a hospital that has GFP on the entire emergency system. This provides a safety issue for the occupants of that facility.

This change will insure we have legally required systems that will function when needed.

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Submittal Date: Wed Sep 06 18:13:44 EDT 2017

Public Input No. 972-NFPA 70-2017 [Section No. 701.26]

701.~~26~~ 31 Ground-Fault Protection of Equipment.

The alternate source for legally required standby systems shall not be required to provide ground-fault protection of equipment with automatic disconnecting means. Ground-fault indication at the legally required standby source shall be provided in accordance with 701.6(D) if ground-fault protection of equipment with automatic disconnecting means is not provided.

Statement of Problem and Substantiation for Public Input

Improve NEC usability as recommended by the NEC Style Manual section 2.4.1 by using parallel numbering within similar Articles.
Related PIs 971 and 973

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 971-NFPA 70-2017 [Section No. 701.25]	
Public Input No. 973-NFPA 70-2017 [Section No. 701.27]	

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Public Input No. 2086-NFPA 70-2017 [Section No. 701.27]

701.27 Selective Coordination.

Legally required standby system(s) overcurrent protective devices shall be selectively coordinated with all supply-side overcurrent protective devices.

Selective coordination shall be selected by a licensed professional engineer or other qualified persons engaged primarily in the design, installation, or maintenance of electrical systems. The selection shall be documented and made available to those authorized to design, install, inspect, maintain, and operate the system.

Exception ~~:~~ ~~Selective coordination shall not be required between two overcurrent devices located in series if no loads are connected in parallel with the downstream device~~ No. 1: Between transformer primary and secondary overcurrent protective devices, where only one overcurrent protective device or set of overcurrent protective devices exists on the transformer secondary.

Exception No. 2: Between overcurrent protective devices of the same size (ampere rating) in series .

Statement of Problem and Substantiation for Public Input

There are two conditions where selective coordination is not possible, overcurrent devices in series and overcurrent devices on the primary and the secondary of a transformer. As currently worded, the exception does not specifically address both these conditions. This proposed revision addresses both conditions (two overcurrent devices in series and overcurrent devices on the primary and secondary of a transformer) and provides clear language for both conditions. In addition, the proposed language in the exceptions matches the language currently found in the exceptions of NEC 517.32(G) which will provide consistency between these two sections of the NEC. In an attempt to achieve consistency between all NEC sections that require selective coordination, similar revisions will be proposed for the following sections:

NEC 620.62
NEC 645.27
NEC 695.3(C)(3)
NEC 700.32
NEC 708.54

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Public Input No. 3455-NFPA 70-2017 [Section No. 701.27]

701.27 Selective Coordination.

Legally required standby system(s) overcurrent devices shall be selectively coordinated with all supply-side overcurrent protective devices.

Selective coordination shall be selected by a licensed professional engineer or other qualified persons engaged primarily in the design, installation, or maintenance of electrical systems. Devices used for selective coordination with adjustable settings shall have those settings adjusted and verified to ensure proper coordination. The selection and device settings shall be documented and made available to those authorized to design, install, inspect, maintain, and operate the system.

Exception: Selective coordination shall not be required between two overcurrent devices located in series if no loads are connected in parallel with the downstream device.

Statement of Problem and Substantiation for Public Input

A high percentage of systems designed for selective coordination utilize devices that have adjustable features. Many of these require electronic devices to setup and adjust. These adjustments must be performed to insure they will function to achieve the desired coordination. Often adjustable settings leave the factory set at minimums, in the design of selective coordination the settings must be adjusted in
relationship to the other devices used within the system.
This added language will complete this concept, insuring that not only do we have a design and equipment installed that is capable of coordination, but that it is properly adjusted to function as intended by the design professional. The documentation will provide the AHJ the needed verification for the project that not only is it installed but that it has been adjusted to perform the required coordination. This is basically a life safety issue that should not be taken lightly.
This report also provides the owner the information required for proper maintenance and servicing especially if future modifications are performed to the project.

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Public Input No. 3709-NFPA 70-2017 [Section No. 701.27]

701.27 Selective Coordination.

Legally required standby system(s) overcurrent devices shall be selectively coordinated with all supply-side overcurrent protective devices.

Selective coordination shall be selected by a licensed professional engineer or other qualified persons engaged primarily in the design, installation, or maintenance of electrical systems. Devices used for selective coordination with adjustable settings shall have those settings adjusted and verified prior to occupancy to insure proper coordination. The selection and device settings shall be documented and made available to those authorized to design, install, inspect, maintain, and operate the system.

Exception: Selective coordination shall not be required between two overcurrent devices located in series if no loads are connected in parallel with the downstream device.

Statement of Problem and Substantiation for Public Input

A high percentage of systems designed for selective coordination utilize devices that have adjustable features. Many of these require electronic devices to setup and adjust. These adjustments must be performed to insure they will function to achieve the desired coordination. Often adjustable settings leave the factory set at minimums, and in the design of selective coordination the settings must be adjusted in relationship to the other devices used within the system.

This added language will complete this concept, insuring that not only do we have a design and equipment installed that is capable of coordination, but that it is properly adjusted to function as intended by the design professional. The documentation will provide the AHJ the needed verification for the project that not only is it installed, but that it has been adjusted to perform the required coordination. This is basically a life safety issue that should not be taken lightly.

This report also provides the owner the information required for proper maintenance and servicing especially if future modifications are performed on the project.

We can have the best design, the best equipment made, and if it is not properly installed and adjusted it will never perform the desired selective coordination.

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Public Input No. 685-NFPA 70-2017 [Section No. 701.27]

701.27 Selective Coordination.

Legally required standby system(s) overcurrent devices shall be selectively coordinated with all supply-side overcurrent protective devices.

Selective coordination overcurent devices shall be selected by a licensed professional engineer or other qualified persons engaged primarily in the design, installation, or maintenance of electrical systems. Adjustable settings for the overcurrent protective devices selected shall also be set by the licensed professional engineer or other qualified persons prior to inspection. The selection and device settings shall be documented and made available to those authorized to design, install, inspect, maintain, and operate the system.

Exception: Selective coordination shall not be required between two overcurrent devices located in series if no loads are connected in parallel with the downstream device.

Statement of Problem and Substantiation for Public Input

I can unequivocally tell CMP 13 that 75% of the the inspections I have performed have had the LSIG or LSI breakers not match the coordination study. I can also tell you with a degree of certainty that most AHJ's do not check this crucial part of the service inspection. Adding this sentence or something similar would be a great start. With the great cost in the design and the specialized breakers that have to occur to meet nec 701.27, it is all for nothing if the settings are not accurate. I tell you with certainty even after commissioning has been performed the settings are typically wrong. Often they are left at factory settings or random settings. I have seen the gamete. There is no direction in the NEC to who is responsible for this very important task. To meet the safeguarding purpose of the NEC this change would provide direction on who is responsible for the settings while instructing the AHJ to verify the settings match the study.

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Submittal Date: Thu May 11 10:08:30 EDT 2017

Public Input No. 973-NFPA 70-2017 [Section No. 701.27]

701.~~27~~ 32 Selective Coordination.

Legally required standby system(s) overcurrent devices shall be selectively coordinated with all supply-side overcurrent protective devices.

Selective coordination shall be selected by a licensed professional engineer or other qualified persons engaged primarily in the design, installation, or maintenance of electrical systems. The selection shall be documented and made available to those authorized to design, install, inspect, maintain, and operate the system.

Exception: Selective coordination shall not be required between two overcurrent devices located in series if no loads are connected in parallel with the downstream device.

Statement of Problem and Substantiation for Public Input

Improve NEC usability as recommended by the NEC Style Manual section 2.4.1 by using parallel numbering within similar Articles.
Related PIs 971 and 972

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 971-NFPA 70-2017 [Section No. 701.25]	
Public Input No. 972-NFPA 70-2017 [Section No. 701.26]	

Submitter Information Verification

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Public Input No. 376-NFPA 70-2017 [Section No. 701.3(B)]

(B) Tested Periodically.

Systems shall be tested periodically on a schedule and in a ~~manner acceptable to the~~ manner approved by the authority having jurisdiction to ensure the systems are maintained in proper operating condition.

Statement of Problem and Substantiation for Public Input

This change is not a technical change. It is intended to be editorial only. This revision is merely an attempt to provide consistent terminology throughout the code. I believe the better word to use in this instance is the term “approved” since it is defined in Article 100 and used throughout the code and generally understood by installers and inspectors alike.

Submitter Information Verification

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Submittal Date: Sun Mar 26 08:47:53 EDT 2017

Public Input No. 4041-NFPA 70-2017 [Section No. 702.1]

702.1 Scope.

The provisions of this article apply to the installation and operation of optional standby systems that incorporate a transfer device to switch between optional and standby power sources . This article does not apply to interactive and interconnected microgrid systems which are addressed in article 705. This article does not apply to prime-power stand-alone systems which are covered in article 710. This article applies to engine generator, stand-alone and multi-mode inverter power sources that used in conjunction with a transfer device.

The systems covered by this article consist of those that are permanently installed in their entirety, including prime movers, and those that are arranged for a connection to a premises wiring system from a portable alternate power supply.

Informational Note: Microgrid systems use a Microgrid Interconnection Device (MID) to interconnect with primary power sources rather than a transfer device. Microgrid systems operate in parallel with the primary source when in interconnected mode.

Informational Note: Some multi-mode inverters have an internal transfer device that switches between optional and standby power sources while others use an internal single-throw MID-type device, in which case they are considered to be microgrid systems.

Statement of Problem and Substantiation for Public Input

This proposed change in scope clarifies that article 702 applies to optional standby systems use a transfer switch to ensure that normal and standby power sources are not interconnected.
It clarifies that 702 applies also to inverter-powered systems and multi-mode inverters.
This distinguishes that ac microgrid systems (which use a single-throw MID device) are not included in the scope, as microgrid systems by definition operate normally in interconnected mode.

I suggest that a task group be appointed between CMP4 and CMP13 to look in particular at the scope of 702, 705 and 710, and to resolve requirements.
A companion PI has been submitted to 705.3 Other Articles and 702.1

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 4054-NFPA 70-2017 [Section No. 705.3]	Related topic
Public Input No. 4020-NFPA 70-2017 [Section No. 710.1]	Related topic

Submitter Information Verification

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I, Robert Wills, 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. 4347-NFPA 70-2017 [Section No. 702.1]

702.1 Scope.

The provisions of this article apply to the installation and operation of optional standby systems.

The systems covered by this article consist of those that are permanently installed in their entirety, including prime movers, and those that are arranged for a connection to a premises wiring system from a portable alternate power supply.

Add third blue text paragraph

Alternate power supply can be incorporated with synchronous generators or with an inverter and energy storage source.

Statement of Problem and Substantiation for Public Input

Ambiguity regarding alternate supply.

Submitter Information Verification

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Public Input No. 2234-NFPA 70-2017 [Section No. 702.2]

702.2 Definition. The definition in this section shall apply within this article and throughout the code.

Optional Standby Systems.

Those systems intended to supply power to public or private facilities or property where life safety does not depend on the performance of the system. These systems are intended to supply on-site generated power to selected loads either automatically or manually.

Informational Note: Optional standby systems are typically installed to provide an alternate source of electric power for such facilities as industrial and commercial buildings, farms, and residences and to serve loads such as heating and refrigeration systems, data processing and communications systems, and industrial processes that, when stopped during any power outage, could cause discomfort, serious interruption of the process, damage to the product or process, or the like.

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

Related Public Inputs for This Document

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

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Submittal Date: Tue Aug 15 12:45:26 EDT 2017

Public Input No. 1140-NFPA 70-2017 [Definition: Optional Standby Systems.]

Optional Standby Systems.

Those systems intended to supply power to public or private facilities or property where life safety does not depend on the performance of the system. These systems are intended to supply on-site generated <u>or stored</u> power to selected loads either automatically or manually.

Informational Note: Optional standby systems are typically installed to provide an alternate source of electric power for such facilities as industrial and commercial buildings, farms, and residences and to serve loads such as heating and refrigeration systems, data processing and communications systems, and industrial processes that, when stopped during any power outage, could cause discomfort, serious interruption of the process, damage to the product or process, or the like.

Statement of Problem and Substantiation for Public Input

this would make it clear 702 includes energy storage systems

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Public Input No. 4115-NFPA 70-2017 [Definition: Optional Standby Systems.]

Optional Standby Systems.

Those systems intended to supply power to public or private facilities or property where life safety does not depend on the performance of the system. These systems are intended to supply on-site generated power to selected loads either automatically or manually. <u>Optional standby systems use transfer devices to prevent the inadvertent interconnection of normal and alternate sources of supply, and are not capable of interactive or interconnected microgrid operation.</u>

Informational Note: Optional standby systems are typically installed to provide an alternate source of electric power for such facilities as industrial and commercial buildings, farms, and residences and to serve loads such as heating and refrigeration systems, data processing and communications systems, and industrial processes that, when stopped during any power outage, could cause discomfort, serious interruption of the process, damage to the product or process, or the like.

Statement of Problem and Substantiation for Public Input

This addition to the definition of optional standby systems clarifies the distinction that 702 applies to systems with transfer switches, and not to prime-power stand-alone systems, interactive systems or interconnected microgrids.

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Public Input No. 11-NFPA 70-2017 [New Article after 702]

702.3 Tests and Maintenance.

(A) Conduct or Witness Test. The authority having jurisdiction shall be permitted to conduct or witness a test of the complete system upon installation.

(B) Maintenance. Permanently install optional standby equipment shall be maintained in accordance with the manufacturer instructions and industry standards.

Statement of Problem and Substantiation for Public Input

The NEC allows the AHJ's to conduct witness tests for emergency and legally required systems, but does not allow for a witness test for optional standby. By using permissive language, the AHJ will have the option to conduct or witness a test of the optional standby system equipment. This would allow the AHJ to verify that the system performs as designed, including the operation of manual or automatic transfer equipment and the operation of a load management system if provided. All manufacturers of automatic generators require that the generator be maintained in accordance with the manufacturer instructions for proper operation of the equipment.

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Public Input No. 868-NFPA 70-2017 [New Section after 702.2]

TITLE OF NEW CONTENT

Type your content here ...

702.3 Other Articles

Opitional Stand-by power supplies shall comply with this Article and also with the applicable requirement of the Articles in Table 702.3

Power Systems	Article
Generator	445
Fuel Cell System	692
Storage Battery	480
Service	230
Energy Storage Systems	706
Uninterruptible Power Supply	710

Statement of Problem and Substantiation for Public Input

other systems need to follow other rules and may have addition methods

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Public Input No. 1290-NFPA 70-2017 [Section No. 702.4(A)]

(A) Available ~~Short-Circuit~~ Fault Current.

Optional standby system equipment shall be suitable for the ~~maximum~~ available ~~short-circuit~~ fault current at its terminals.

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. 1249-NFPA 70-2017 [Section No. 110.24(A)]	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. 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

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Public Input No. 2487-NFPA 70-2017 [Section No. 702.4(B)]

(B) System Capacity.

The calculations of load on the standby source shall be made in accordance with Article 220~~ or by another approved method.~~ . Calculations for system capacity shall also be permitted based on the type of transfer equipment in (1) or (2).

(1) Manual Transfer Equipment.

Where manual transfer equipment is used, an optional standby system shall have adequate capacity and rating for the supply of all equipment intended to be operated at one time. The user of the optional standby system shall be permitted to select the load connected to the system.

(2) Automatic Transfer Equipment.

Where automatic transfer equipment is used, an optional standby system shall comply with (2)(a) or (2)(b).

(a) *Full Load.* The standby source shall be capable of supplying the full load that is transferred by the automatic transfer equipment.

(b) *Load Management.* Where a system is employed that will automatically manage the connected load, the standby source shall have a capacity sufficient to supply the maximum load that will be connected by the load management system.

Statement of Problem and Substantiation for Public Input

Optional standby systems are required to have a system capacity either calculated by Article 220 methods or another approved method. However, the manual and automatic transfer equipment methods in (1) and (2) also allow optional standby systems to have system capacity based on the amount of load transferred at one time, by load management, or by simply the full load. The revisions that are being proposed will help clarify that there are several methods to perform optional standby calculations beyond just Article 220.

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Public Input No. 3479-NFPA 70-2017 [Section No. 702.5]

702.5 Transfer Equipment.

Transfer equipment shall be suitable for the intended use and designed and installed so as to prevent the inadvertent interconnection of normal and alternate sources of supply in any operation of the transfer equipment. Transfer equipment and electric power production systems installed to permit operation in parallel with the normal source shall meet the requirements of Article 705.

Transfer switches installed between the utility meter and the meter socket enclosure shall be listed meter mounted transfer switches. These transfer switches shall be non-automatic (manual), unless rated for transfer of load currents no less than the current rating of the meter mounting equipment.

Transfer equipment , located on the load side of branch circuit protection, shall be permitted to contain supplemental overcurrent protection having an interrupting rating sufficient for the available fault current that the generator can deliver. The supplementary overcurrent protection devices shall be part of a listed transfer equipment.

Transfer equipment shall be required for all standby systems subject to the provisions of this article and for which an electric utility supply is either the normal or standby source.

Exception: Temporary connection of a portable generator without transfer equipment shall be permitted where conditions of maintenance and supervision ensure that only qualified persons service the installation and where the normal supply is physically isolated by a lockable disconnecting means or by disconnection of the normal supply conductors.

The short-circuit current rating of the transfer equipment, based on the specific overcurrent protective device type and settings protecting the transfer equipment, shall be field marked on the exterior of the transfer equipment.

Statement of Problem and Substantiation for Public Input

Meter mounted transfer switches are currently available and are being installed to facilitate optional standby systems typically in dwelling units. The NEC must recognize the use of these switches and build additional requirements necessary to ensure safe installation and use. Listed meter mounted transfer switches are readily available. It is imperative that these switches be listed to meet the same product standards as other types of transfer switches currently being used in optional standby systems.

When these switches operate automatically, they must be suitable for switching the entire load supplied by the service, since they located directly in line with the utility meter. If the transfer switch is non-automatic, manual intervention is required, and the use will be required to disconnect those branch circuits that cannot be supported by the generator.

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

Submitter Information Verification

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Copyright Assignment

Public Input No. 4351-NFPA 70-2017 [Section No. 702.5]

702.5 Transfer Equipment.

Transfer equipment shall be suitable for the intended use and designed and installed so as to prevent the inadvertent interconnection of normal and alternate sources of supply in any operation of the transfer equipment. Transfer equipment and electric power production systems installed to permit operation in parallel with the normal source shall meet the requirements of Article 705.

<u>Add Notation: Except when transfer equipment is paralleling switchgear. Article 705 generally describes inverter based systems.</u>

Transfer equipment, located on the load side of branch circuit protection, shall be permitted to contain supplemental overcurrent protection having an interrupting rating sufficient for the available fault current that the generator can deliver. The supplementary overcurrent protection devices shall be part of a listed transfer equipment.

Transfer equipment shall be required for all standby systems subject to the provisions of this article and for which an electric utility supply is either the normal or standby source.

Exception: Temporary connection of a portable generator without transfer equipment shall be permitted where conditions of maintenance and supervision ensure that only qualified persons service the installation and where the normal supply is physically isolated by a lockable disconnecting means or by disconnection of the normal supply conductors.

The short-circuit current rating of the transfer equipment, based on the specific overcurrent protective device type and settings protecting the transfer equipment, shall be field marked on the exterior of the transfer equipment.

Statement of Problem and Substantiation for Public Input

Inadequate specificity for systems that use paralleling switchgear can lead section 702 to be misleading. During IEEE P1547 comment resolution, we were unable to reference this section due to ambiguity,

More extensive changes and wording could be contributed if allowed more time to develop with other members of committee.

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Public Input No. 622-NFPA 70-2017 [Section No. 702.5]

702.5 Transfer Equipment.

Transfer equipment shall be suitable for the intended use and designed and installed so as to prevent the inadvertent interconnection of normal and alternate sources of supply or the inadvertent interconnection of more than one alternate source of supply , in any operation of the transfer equipment. Transfer equipment and electric power production systems installed to permit operation in parallel with the normal source shall meet the requirements of Article 705.

Transfer equipment, located on the load side of branch circuit protection, shall be permitted to contain supplemental overcurrent protection having an interrupting rating sufficient for the available fault current that the generator can deliver. The supplementary overcurrent protection devices shall be part of a listed transfer equipment.

Transfer equipment shall be required for all standby systems subject to the provisions of this article and for which an electric utility supply is either the normal or standby source.

Exception: Temporary connection of a portable generator without transfer equipment shall be permitted where conditions of maintenance and supervision ensure that only qualified persons service the installation and where the normal supply is physically isolated by a lockable disconnecting means or by disconnection of the normal supply conductors.

The short-circuit current rating of the transfer equipment, based on the specific overcurrent protective device type and settings protecting the transfer equipment, shall be field marked on the exterior of the transfer equipment.

Statement of Problem and Substantiation for Public Input

It is common for optional standby systems to be designed with a point of connection through transfer equipment for two alternate sources of supply, such as the connection of a portable and a permanent generator source. Currently, Article 702 only addresses the safety concerns of inadvertent connection between normal and alternate sources of supply and not the scenario mentioned.

By adding the proposed wording the section will now address the inadvertent connection between two alternate sources of power.

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Copyright Assignment

I, David Hittinger, 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 David Hittinger, 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. 8-NFPA 70-2017 [Section No. 702.5]

702.5 Transfer Equipment.

Transfer equipment shall be suitable for the intended use and designed and installed so as to prevent the inadvertent interconnection of normal and alternate sources of supply in any operation of the transfer equipment. ~~Transfer~~ The removal of equipement doors or panels shall not result in defeating the interlocking mechanism. Transfer equipment and electric power production systems installed to permit operation in parallel with the normal source shall meet the requirements of Article 705.

Transfer equipment, located on the load side of branch circuit protection, shall be permitted to contain supplemental overcurrent protection having an interrupting rating sufficient for the available fault current that the generator can deliver. The supplementary overcurrent protection devices shall be part of a listed transfer equipment. Transfer equipement, located on the supply side of an existing service disconnecting menas shall be installed in accordanace with 230.82(5).

Transfer equipment shall be required for all standby systems subject to the provisions of this article and for which an electric utility supply is either the normal or standby source.

Exception: Temporary connection of a portable generator without transfer equipment shall be permitted where conditions of maintenance and supervision ensure that only qualified persons service the installation and where the normal supply is physically isolated by a lockable disconnecting means or by disconnection of the normal supply conductors.

~~The~~ In other than dwelling units, the short-circuit current rating of the transfer equipment, based on the specific overcurrent protective device type and settings protecting the transfer equipment, shall be field marked on the exterior of the transfer equipment.

Statement of Problem and Substantiation for Public Input

The UL 1008 standard has requirements for transfer equipment that prevents the removal or equipment doors or panel from defeating the interlocking mechanism. A common installation practice is the installation of cover mounted manual interlocks to modify an existing panelboard into a manual transfer switch. If the cover is removed, the interlock is defeated and can cause the inadvertent interconnection of normal and alternate supplies of power. Many panelboard interlocking kits are available for use and are UL 67 recognized as panelboard accessories, however these kits mount to the panelboard, not to the exterior of the enclosure cover and remain in place if the cover is removed. The change will provide clarity that cover mounted interlocks do not meet the minimum NEC requirements.

A common installation practice is the installation of a transfer switch on an existing electrical service to back up the entire electrical service with optional standby power. When the transfer equipment is installed on the supply side of an existing service disconnecting means, the transfer switch should be UL listed as suitable for use as service equipment and installed as such. Directing the code user to 230.82(5) make its clear that non service rated transfer equipment is not permitted to be installed in place of service rated equipment.

110.24 has language that does not require the service equipment in dwelling units to be field marked with the available fault current, so there should be no need to field mark the transfer equipment in accordance with 702.5 when installed in a dwelling unit. The available short circuit circuit in a dwelling unit is generally below 22 kA and as long as the transfer equipment has a SCCR rating equal or greater than the available fault current, the installation meets the minimum code requirements.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 29-NFPA 70-2017 [Section No. 230.82]	Both cover the installation requirements for service rated transfer equipment

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Submittal Date: Fri Jan 20 12:17:18 EST 2017

Copyright Assignment

Public Input No. 279-NFPA 70-2017 [Section No. 702.6]

702.6 Signals.

~~Audible and visual~~

Visual signal devices shall be provided, where practicable, for the following purposes specified in 702.6(A) and (B).

(A) Malfunction.

To indicate malfunction of the optional standby source.

(B) Carrying Load.

To indicate that the optional standby source is carrying load.

Exception: Signals shall not be required for portable standby power sources.

Statement of Problem and Substantiation for Public Input

Audible annunciation should not be required for an optional standby system where the system visually signals that there is a malfunction of the system or the system is carrying load. Many of the generator manufacturers utilize cellular or Wi-Fi enabled annunciation that will signal to the end user and service technicians any malfunction of the optional standby system and when the optional system is operating and carrying load.

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Public Input No. 862-NFPA 70-2017 [Section No. 702.11]

702.~~11~~ ~~Portable Generator~~ 11 System Grounding.

(A) Separately Derived System.

Where ~~a portable~~ an optional standby source is used as a separately derived system, it shall be grounded to a grounding electrode in accordance with 250.30.

(B) Nonseparately Derived System.

Where ~~a portable~~ an optional standby source is used as a nonseparately derived system, the equipment grounding or supply side equipment bonding conductor shall be bonded to the Normal power system grounding electrode.

Statement of Problem and Substantiation for Public Input

additional power systems are available and this text includes other systems

Submitter Information Verification

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Public Input No. 857-NFPA 70-2017 [Section No. 702.12]

702.~~12~~ 12 Sources of Power

(A) Outdoor Generator Sets.

(~~A~~ a) Portable Generators Greater Than 15 kW and Permanently Installed Generators.

Where an outdoor housed generator set is equipped with a readily accessible disconnecting means in accordance with 445.18, and the disconnecting means is located within sight of the building or structure supplied, an additional disconnecting means shall not be required where ungrounded conductors serve or pass through the building or structure. Where the generator supply conductors terminate at a disconnecting means in or on a building or structure, the disconnecting means shall meet the requirements of 225.36.

(~~B~~ b) Portable Generators 15 kW or Less.

Where a portable generator, rated 15 kW or less, is installed using a flanged inlet or other cord- and plug-type connection, a disconnecting means shall not be required where ungrounded conductors serve or pass through a building or structure.

(~~C~~ c) Power Inlets Rated at 100 Amperes or Greater, for Portable Generators.

Equipment containing power inlets for the connection of a generator source shall be listed for the intended use. Systems with power inlets shall be equipped with an interlocked disconnecting means.

Exception No. 1: If the inlet device is rated as a disconnecting means

Exception No. 2: Supervised industrial installations where permanent space is identified for the portable generator located within line of sight of the power inlets shall not be required to have interlocked disconnecting means nor inlets rated as disconnects.

(B) Indoor Generator Sets

(C) Storage Battery

Storage batteries shall be of suitable rating and capacity to supply and mantain the required load for the amont of time as determind by the owner

(a) an automatic charging means shall be required

informational note: the charging means may be from uility, PV, Wind electric or other power systems

(D) Uninterruptible power supplies (UPS)

(E) Fuel Cell System

(F) Energy Storage Systems

(G) Service

(H) On site fuel supply

If fuel is required to supply the the opitional standby system it shall be of sufficiant duration as required by the owners

Statement of Problem and Substantiation for Public Input

this section recognize alternative power supplies for optional stand-by systems

Submitter Information Verification

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Submittal Date: Mon May 29 15:34:23 EDT 2017

Copyright Assignment

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Public Input No. 1035-NFPA 70-2017 [Section No. 702.12(A)]

(A) Portable Generators Greater Than 15 kW and Permanently Installed Generators.

Where an outdoor housed generator set is equipped with a readily accessible disconnecting means in accordance with 445.18, and the disconnecting means enclosure or prime mover shutdown initiator is located within sight of the building or structure supplied, an additional disconnecting means shall not be required where ungrounded conductors serve or pass through the building or structure. Where the generator supply conductors terminate at a disconnecting means in or on a building or structure, the disconnecting means shall meet the requirements of 225.36.

Additional Proposed Changes

File Name	Description	Approved
images-1.jpg	nema 3 enclosure	✓
3HWP7_AS01.jpg	circuit breaker enclosure	✓

Statement of Problem and Substantiation for Public Input

some electrical specialist say you need to see the actual disconnection means to comply with this section. such as the handle of the switch or circuit breaker switch that means no circuit breaker can be used for this section when it is behind a cover of an enclosure, which all nema rated enclosures are. the new language would include the enclosure of the disconnecting means to be with in sight, so a Circuit breaker style disconnect could comply and the section. We also need to include the initiator e-button because it to is not technically a disconnecting means or in an enclosure and because the section references any means allowed in 445.18. it to would have to be mentioned to be allowed for the building disconnect.

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Public Input No. 2761-NFPA 70-2017 [New Part after II.]

Maximum Voltage.

For self-contained or pre-engineered systems of matched components intended for field assembly as a system, the maximum voltage shall be the rated ESS input and output voltage(s) indicated on the ESS nameplate(s) or system listing.

For other ESS, the maximum voltage for each circuit shall be per the following:

1. ESS maximum dc circuit voltage shall be calculated based on the highest charging voltage, including any temperature compensation and equalization.
2. ESS maximum ac circuit voltage shall be the nominal ac voltage.
3. For circuits connected to two or more series connected dc-to-dc converters, the maximum voltage shall be determined in accordance with the instructions included in the listing or labeling of the dc-to-dc converter. If these instructions do not state the rated voltage of series-connected dc-to-dc converters, the maximum voltage shall be the sum of the maximum rated voltage output of the dc-to-dc converters.
4. For circuits connected to the output of a single dc-to-dc converter, the maximum voltage shall be the rated maximum voltage output of the dc-to-dc converter.

Statement of Problem and Substantiation for Public Input

There are a number of places throughout this article where reference to the voltage of the energy storage system circuits is made. For example; in marking requirements, in a calculation, as a threshold, or to ensure proper coordination of equipment ratings. However the article gives no guidance on how to determine the appropriate value to use in these instances. The proposed addition provides clear guidance that the value as marked in the ratings shall be used for self-contained or pre-engineered ESS. For other systems, the highest charging voltage, including any temperature compensation and equalization, shall be used for dc circuits. The nominal ac voltage shall be used for ac circuits. For dc-to-dc converters it is important to clarify the voltage must be either the maximum output of a single converter, or for series connected converters, it must be either in accordance with the instructions included with the listing or the sum of the maximum voltage outputs in series.

This PI was developed by the PV Industry Forum (PVIF). For a description of the PVIF, please see PI-2751

Submitter Information Verification

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Public Input No. 3485-NFPA 70-2017 [New Part after III.]

TITLE OF NEW CONTENT

342.100 Construction. IMC shall be made of one of the following:

(1) Steel, with protective coatings

(2) Stanless steel

Statement of Problem and Substantiation for Public Input

Move Section 342.100 to Part III Construction Specifications. This is an editorial change and will be consistent with the other raceway articles.

Submitter Information Verification

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Submittal Date: Wed Sep 06 11:49:35 EDT 2017

Public Input No. 1712-NFPA 70-2017 [New Article after 706]

706.12. Maintenance.

Energy storage systems shall be maintained in proper and safe operating condition. The required maintenance shall be in accordance with the manufacturer's requirements and industry standards and on a schedule acceptable to the authority having jurisdiction. A written record of the system maintenance shall be kept and shall include records of repairs and replacements necessary to maintain the system in proper and safe operating condition.

Informational Note: For information related to general electrical equipment maintenance and developing an Effective Electrical Preventive Maintenance (EPM) program, see NFPA 70B *Recommended Practice for Electrical Equipment Maintenance* .

Statement of Problem and Substantiation for Public Input

This new requirement is simple, necessary, and fills a gap in Article 706. Energy storage systems often include components such as electrochemical batteries of various types. These systems and their components often require maintenance and response as components need repair. Battery maintenance systems typically provide continuous output of information related to the state of system components. The new requirement will call attention to the need for effective maintenance and even monitoring in some cases to avoid system component failure that could result in failures that could impact the safety of buildings and structures in addition to personnel.

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Submittal Date: Thu Aug 03 15:26:02 EDT 2017

Public Input No. 2869-NFPA 70-2017 [Definition: Energy Storage System (ESS).]

Energy Storage System (ESS).

One or more components assembled together capable of storing ~~energy for use at a future time~~ and providing electrical energy into the premises wiring system or an electric power production and distribution network . ESS(s) can include but is not limited to batteries, capacitors, and kinetic energy devices (e.g., flywheels and compressed air). These systems can have ac or dc output for utilization and can include inverters and converters to change stored energy into electrical energy.

Energy Storage System, Self-Contained.

Energy storage systems where the components such as cells, batteries, or modules and any necessary controls, ventilation, illumination, fire suppression, or alarm systems are assembled, installed, and packaged into a singular energy storage container or unit.

Informational Note: Self-contained systems will generally be manufactured by a single entity, tested and listed to safety standards relevant to the system, and readily connected on site to the electrical system and in the case of multiple systems to each other.

Energy Storage System, Pre-Engineered of Matched Components.

Energy storage systems that are not self-contained systems but instead are pre-engineered and field-assembled using separate components supplied as a system by a singular entity that are matched and intended to be assembled as an energy storage system at the system installation site.

Informational Note: Pre-engineered systems of matched components for field assembly as a system will generally be designed by a single entity and comprised of components that are tested and listed separately or as an assembly.

Energy Storage System, Other.

Energy storage systems that are not self-contained or pre-engineered systems of matched components but instead are composed of individual components assembled as a system.

Informational Note: Other systems will generally be comprised of different components combined on site to create an ESS. Those components would generally be tested and listed to safety standards relevant to the application.

Statement of Problem and Substantiation for Public Input

Statement of Problem: The definition of an energy storage system was a new addition to the 2017 version of the NEC. Improvements to the definition will help users of the NEC better apply this new article to electrical installations.

Substantiation:
We propose to add the phrase “and providing electrical” to the original text in an effort to clarify that energy storage systems covered under article 706 will both store and provide electrical energy, as opposed to any other energy storage systems (such as mechanical or thermal). The phrase “into the premises wiring system or an electric power production and distribution network” is provided to clarify that energy storage systems may supply power to both premises wiring and larger electrical distribution systems that may be off the premises they are installed within. An ESS is not intended to be connected exclusively to a single utilization equipment load.

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Submittal Date: Mon Aug 28 15:04:13 EDT 2017

Copyright Assignment

Public Input No. 2987-NFPA 70-2017 [Definition: Energy Storage System (ESS).]

Energy Storage System (ESS).

One or more components assembled together capable of storing ~~energy for use at a future time.~~ and providing energy into the premises wiring system.

Informational Note 1: ESS(s) can include but is not limited to batteries, capacitors, and kinetic energy devices (e.g., flywheels and compressed air). ~~These systems can have ac or dc output for utilization and can include inverters and converters to change stored energy into electrical energy~~ Energy Storage Systems can include inverters or converters to change voltage levels or to make a change between an ac or a dc system.

Informational Note 2: These systems differ from other storage systems such as UPS systems which supply energy for voltage regulation when power is lost .

Energy Storage System, Self-Contained.

Energy storage systems where the components such as cells, batteries, or modules and any necessary controls, ventilation, illumination, fire suppression, or alarm systems are assembled, installed, and packaged into a singular energy storage container or unit.

Informational Note: Self-contained systems will generally be manufactured by a single entity, tested and listed to safety standards relevant to the system, and readily connected on site to the electrical system and in the case of multiple systems to each other.

Energy Storage System, Pre-Engineered of Matched Components.

Energy storage systems that are not self-contained systems but instead are pre-engineered and field-assembled using separate components supplied as a system by a singular entity that are matched and intended to be assembled as an energy storage system at the system installation site.

Informational Note: Pre-engineered systems of matched components for field assembly as a system will generally be designed by a single entity and comprised of components that are tested and listed separately or as an assembly.

Energy Storage System, Other.

Energy storage systems that are not self-contained or pre-engineered systems of matched components but instead are composed of individual components assembled as a system.

Informational Note: Other systems will generally be comprised of different components combined on site to create an ESS. Those components would generally be tested and listed to safety standards relevant to the application.

Statement of Problem and Substantiation for Public Input

This public input is the result of an Energy Storage Task Group that was put together by CMP 13 to correlate Article 706, Energy Storage Systems and Article 480, Batteries. Various sections between the two articles were redundant while certain sections in Article 706 strictly pertained to batteries and were better suited in the Battery article. It was also the charge of the task group to better define Energy Storage Systems. The Task Group members were Larry Ayer, Jim Dollard, Dan Neeser, Mario Spina, Tim Croushore, Bill Cantor, Chad Kennedy, Steve Froemming, John Kovacik and Dan Caron.

This specific public input is editorial and seeks to better define an Energy Storage System. In the previous cycle an Energy Storage System may have been confused with a UPS system or a large battery system that is used onlly when power is lost to the building. The revised definition provides additional clarity that an ESS can store and provide energy during normal operating conditions.

The first informational note has been revised for usability and a second informational note has been added to clarify that UPS and other storage systems are not considered an ESS.

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Public Input No. 2760-NFPA 70-2017 [Definition: Energy Storage System (ESS). [Excluding any Sub...]

One or more components assembled together capable of storing energy for ~~use~~ providing electrical energy at a future time. These systems can have ac or dc output for utilization and can include inverters and converters to change stored energy into electrical energy.

Informational Note: ESS(s) can include ~~but is not limited to~~ batteries, capacitors, and kinetic energy devices (e.g., flywheels and compressed air). ~~These systems can have ac or dc output for utilization and can include inverters and converters to change stored energy into electrical energy.~~

Statement of Problem and Substantiation for Public Input

The proposed change clarifies that the scope of the article applies to electrical energy storage applications. Systems such as thermal energy for cooling or heating are not addressed within this article. Describing the type of equipment in an informational note allows greater flexibility and does not specifically require or allow a list of equipment.

This PI was developed by the PV Industry Forum (PVIF). For a description of the PVIF, please see PI-2751

Submitter Information Verification

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Submittal Date: Fri Aug 25 18:13:10 EDT 2017

Public Input No. 3840-NFPA 70-2017 [Definition: Energy Storage System, Pre-Engineered of Matche...]

Energy Storage System, Pre-Engineered ~~of Matched Components~~ .

Energy storage systems that are not self-contained systems but instead are pre-engineered and field-assembled using separate components supplied as a system by a singular entity that ~~are matched and~~ intended to be assembled as an energy storage system at the system installation site.

Informational Note: Pre-engineered systems ~~of matched components~~ for field assembly as a system will generally be designed by a single entity and comprised of components that are tested and listed separately or as an assembly.

Statement of Problem and Substantiation for Public Input

I know of no definition for “matched components” or other usage in the NEC but I assume this is intended to mean components that are intended to work together. Since I can’t imagine a company putting together a pre-engineered system out of unmatched components, or how someone would determine if the components in a pre-engineered system were matched or not the text should be deleted as unenforceable.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3842-NFPA 70-2017 [Section No. 706.20(A)(1)]	Go together
Public Input No. 3838-NFPA 70-2017 [Section No. 706.4]	Go together

Submitter Information Verification

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Submittal Date: Thu Sep 07 00:48:21 EDT 2017

Public Input No. 2776-NFPA 70-2017 [Definition: Energy Storage System, Self-Contained.]

Energy Storage System, Self-Contained.

Energy storage systems where the components such as cells, batteries, or modules and any necessary controls, ventilation, illumination, fire suppression, or alarm systems are assembled, installed, and packaged into a singular energy storage container or unit.

Informational Note: Self-contained systems ~~will generally be manufactured by a single entity,~~ <u>are</u> tested and listed to safety standards relevant to the system, and readily connected on site to the electrical system and in the case of multiple systems to each other.

Statement of Problem and Substantiation for Public Input

The proposed change is aligned with proposed changes to 706.5 to make listing a requirement for all self-contained ESS.

This PI was developed by the PV Industry Forum (PVIF). For a description of the PVIF, please see PI-2751

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2754-NFPA 70-2017 [Section No. 706.5]	
Public Input No. 2755-NFPA 70-2017 [Section No. 706.4]	

Submitter Information Verification

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Submittal Date: Fri Aug 25 19:08:34 EDT 2017

Public Input No. 3265-NFPA 70-2017 [Definition: Energy Storage System, Self-Contained.]

Energy Storage System, Self-Contained.

Energy storage systems where the components such as cells, batteries, or modules and any necessary controls, ventilation, illumination, fire suppression, inverter, motor generator, or alarm systems are assembled, installed, and packaged into a singular energy storage container or unit.

Informational Note: Self-contained systems will generally be manufactured by a single entity, tested and listed to safety standards relevant to the system, and readily connected on site to the electrical system and in the case of multiple systems to each other.

Statement of Problem and Substantiation for Public Input

Recommend adding inverter and motor generator to the the list of components that might be included in a self-contained ESS system. one of those is going to be the primary way to get an AC voltage out of a package system.

Submitter Information Verification

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Submittal Date: Tue Sep 05 00:14:18 EDT 2017

Public Input No. 3267-NFPA 70-2017 [Definition: Inverter Input Circuit.]

Inverter Input Circuit.

Conductors between the inverter and the ESS in stand-alone and multimode inverter systems <u>where the inverter is not an intrigal part of a pre-engineered or self-contained ESS</u> .

Statement of Problem and Substantiation for Public Input

The conductors are only considered if they are not part of a listed assembly. Without this restriction an AHJ might read this to apply to listed ESS systems that contain an inverter.

Submitter Information Verification

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Submittal Date: Tue Sep 05 00:22:00 EDT 2017

Public Input No. 4255-NFPA 70-2017 [Definition: Inverter Input Circuit.]

~~**Inverter Input Circuit.**~~

~~Conductors between the inverter and the ESS in stand-alone and multimode inverter systems.~~

Statement of Problem and Substantiation for Public Input

This public input seeks to remove this definition from this location and move it to Article 100 since it is used in several articles. Please see related PIs.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 4250-NFPA 70-2017 [New Definition after Definition: Intrinsically Safe System ...]	New definition in Article 100
Public Input No. 4252-NFPA 70-2017 [Definition: Inverter Input Circuit.]	Original source language from Article 690 for new Article 100

Submitter Information Verification

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Submittal Date: Thu Sep 07 17:30:33 EDT 2017

Public Input No. 4262-NFPA 70-2017 [Definition: Inverter Output Circuit.]

~~**Inverter Output Circuit.**~~

~~Conductors between the inverter and another electric power production source, such as a utility for an electrical production and distribution network.~~

Statement of Problem and Substantiation for Public Input

This public input seeks to remove this definition from this location and move it to Article 100 since it is used in several articles. Please see related PIs.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 4248-NFPA 70-2017 [New Definition after Definition: Intrinsically Safe System ...]	New definition in Article 100
Public Input No. 4257-NFPA 70-2017 [Definition: Inverter Output Circuit.]	Original source language from Article 690 for new Article 100
Public Input No. 4259-NFPA 70-2017 [Definition: Inverter Output Circuit.]	Public Input to remove definition from Article 694

Submitter Information Verification

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Submittal Date: Thu Sep 07 17:48:47 EDT 2017

Public Input No. 2777-NFPA 70-2017 [Definition: Inverter Utilization Output Circuit.]

Inverter Utilization Output Circuit.

Conductors between the multimode or ~~standalone~~ stand-alone inverter and utilization equipment.

Statement of Problem and Substantiation for Public Input

Hyphenation of stand-alone aligns this term with other uses in the Code.

This PI was developed by the PV Industry Forum (PVIF). For a description of the PVIF, please see PI-2751

Submitter Information Verification

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Submittal Date:	Fri Aug 25 19:17:38 EDT 2017

Public Input No. 2379-NFPA 70-2017 [New Section after 706.11(B)]

706.12 Maintenance . Energy storage systems shall be maintained in proper and safe operating condition. The required maintenance shall be in accordance with the manufacturer's requirements and industry standards and on a schedule acceptable to the authority having jurisdiction. A written record of the system maintenance shall be kept and shall include records of repairs and replacements necessary to maintain the system in proper and safe operating condition.

Informational Note: For information related to general electrical equipment maintenance and developing an Effective Electrical Preventive Maintenance (EPM) program, see NFPA 70B Recommended Practice for Electrical Equipment Maintenance.

Statement of Problem and Substantiation for Public Input

This new requirement is simple, necessary, and fills a gap in Article 706. Energy storage systems often include components such as electrochemical batteries of various types. These systems and their components often require maintenance and response as components need repair. Battery maintenance systems typically provide continuous output of information related to the state of system components. The new requirement will call attention to the need for effective maintenance and even monitoring in some cases to avoid system component failure that could result in failures that could impact the safety of buildings and structures in addition to personnel.

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Public Input No. 951-NFPA 70-2017 [New Section after 706.8]

706.9 Qualified Personnel. The installation of ESS equipment and all associated wiring and interconnections shall be performed only by qualified persons.

Statement of Problem and Substantiation for Public Input

The installation and maintenance of energy storage systems must be installed by persons trained specifically in the unique requirements and hazards of these systems. Improper installation and/or maintenance can result a catastrophic failure. It is imperative to require qualified installers.
The text in this proposed new section mirrors the requirements for qualified personnel for the installation of PV systems. See 690.4(C).

Submitter Information Verification

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Public Input No. 1108-NFPA 70-2017 [Section No. 706.1]

706.1 Scope.

This article applies to all permanently installed energy storage systems (ESS) operating at over 50 volts ac or 60 volts dc that may be stand-alone or interactive with other electric power production sources.

Informational Note: The following standards are frequently referenced for the installation of energy storage systems:

(1) NFPA 111-2013, *Standard on Stored Electrical Energy Emergency and Standby Systems*

(2) IEEE 484-2008, *Recommended Practice for Installation Design and Installation of Vented Lead-Acid Batteries for Stationary Applications*

(3) IEEE 485-1997, *Recommended Practice for Sizing Vented Lead-Acid Storage Batteries for Stationary Applications*

(4) IEEE 1145-2007, *Recommended Practice for Installation and Maintenance of Nickel-Cadmium Batteries for Photovoltaic (PV) Systems*

(5) IEEE 1187-2002, *Recommended Practice for Installation Design, and Installation of Valve-Regulated Lead-Acid Batteries for Stationary Applications*

(6) IEEE 1578-2007, *Recommended Practice for Stationary Battery Electrolyte Spill Containment and Management*

(7) IEEE 1635/ASHRAE 21-2012, *Guide for the Ventilation and Thermal Management of Batteries for Stationary Applications*

(8) UL 810A, *Electrochemical Capacitors*

(9) UL 1973, *Batteries for Use in Light Electric Rail (LER) Applications and Stationary Applications*

(10) UL 1989, *Standard for Standby Batteries*

(11) UL Subject 2436, *Spill Containment For Stationary Lead Acid Battery Systems*

(12) UL Subject 9540, *Safety of Energy Storage Systems and Equipment*

(13) NECA 416, *Recommended Practice for Installing Energy Storage Systems (ESS)*

Statement of Problem and Substantiation for Public Input

This Public Input seeks to include another ANSI recommended practice that addresses quality, performance, and workmanship issues related to installing multiple types of energy storage systems. Good Workmanship in Electrical Construction is required in 110.12 but this and other issues are not specifically addressed in the NEC in a manner that NECA 416 addresses them.

Submitter Information Verification

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Public Input No. 2751-NFPA 70-2017 [Section No. 706.1]

706.1 Scope.

This article applies to all permanently installed energy storage systems (ESS) ~~operating at over 50 volts ac or 60 volts dc~~ having a capacity greater than 3.6 MJ (1 KWh) that may be stand-alone or interactive with other electric power production sources.

Informational Note 1 : Informational Note No. 1: For batteries rated in Amp-Hours, KWh is equal to the nominal rated voltage times amp-hour rating divided by 1000.

Informational Note 2: The following standards are frequently referenced for the installation of energy storage systems:

(1) NFPA 111-2013, *Standard on Stored Electrical Energy Emergency and Standby Systems*

(2) IEEE 484-2008, *Recommended Practice for Installation Design and Installation of Vented Lead-Acid Batteries for Stationary Applications*

(3) IEEE 485-1997, *Recommended Practice for Sizing Vented Lead-Acid Storage Batteries for Stationary Applications*

(4) IEEE 1145-2007, *Recommended Practice for Installation and Maintenance of Nickel-Cadmium Batteries for Photovoltaic (PV) Systems*

(5) IEEE 1187-2002, *Recommended Practice for Installation Design, and Installation of Valve-Regulated Lead-Acid Batteries for Stationary Applications*

(6) IEEE 1578-2007, *Recommended Practice for Stationary Battery Electrolyte Spill Containment and Management*

(7) IEEE 1635/ASHRAE 21-2012, *Guide for the Ventilation and Thermal Management of Batteries for Stationary Applications*

(8) UL 810A, *Electrochemical Capacitors*

(9) UL 1973, *Batteries for Use in Light Electric Rail (LER) Applications and Stationary Applications*

(10) UL 1989, *Standard for Standby Batteries*

(11) UL Subject 2436, *Spill Containment For Stationary Lead Acid Battery Systems*

(12) UL Subject 9540, *Safety of Energy Storage Systems and Equipment*

Additional Proposed Changes

File Name	Description	Approved
PV_Industry_Forum.pdf		✓

Statement of Problem and Substantiation for Public Input

Replacing minimum voltage values with minimum energy values is offered to close the gap that currently exists in the NEC 2017 language, while maintaining an allowance for applications of small energy storage equipment commonly used to serve dedicated utilization equipment such as tools, alarm systems, emergency lighting or similar applications. The capacity threshold of 3.6 MJ (1 kWh) aligns with building and fire codes. This value is slightly greater than two 12V, 40 Ah batteries.

This PI was developed by the PV Industry Forum (PVIF).

Submitter Information Verification

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Submittal Date: Fri Aug 25 17:15:23 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:

<u>Coordinating committee:</u>
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

<u>Conveners:</u>
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Ward Bower, Ward Bower Innovations
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Marvin Hamon, Hamon Engineering
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Sagar Khare, Maxim Integrated
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Blair Reynolds, Enphase Energy
Paul Robusto, MiaSole
Mark Rodriguez, Sunrun
Miles Russell, Solectria
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Public Input No. 2759-NFPA 70-2017 [Section No. 706.1]

706.1 Scope.

This article applies to all permanently installed energy storage systems (ESS) operating at over 50 volts ac or 60 volts dc that may be stand-alone or interactive with other electric power production sources.

Informational Note: The following standards are frequently referenced for the installation of energy storage systems:

(1) NFPA 111-2013, *Standard on Stored Electrical Energy Emergency and Standby Systems*

(2) <u>NFPA 855-201x, Standard for the Installation of Stationary Energy Storage Systems</u>

(3) IEEE 484-2008, *Recommended Practice for Installation Design and Installation of Vented Lead-Acid Batteries for Stationary Applications*

(4) IEEE 485-1997, *Recommended Practice for Sizing Vented Lead-Acid Storage Batteries for Stationary Applications*

(5) IEEE 1145-2007, *Recommended Practice for Installation and Maintenance of Nickel-Cadmium Batteries for Photovoltaic (PV) Systems*

(6) IEEE 1187-2002, *Recommended Practice for Installation Design, and Installation of Valve-Regulated Lead-Acid Batteries for Stationary Applications*

(7) IEEE 1578-2007, *Recommended Practice for Stationary Battery Electrolyte Spill Containment and Management*

(8) IEEE 1635/ASHRAE 21-2012, *Guide for the Ventilation and Thermal Management of Batteries for Stationary Applications*

(9) UL 810A, *Electrochemical Capacitors*

(10) UL 1973, *Batteries for Use in Light Electric Rail (LER) Applications and Stationary Applications*

(11) UL 1989, *Standard for Standby Batteries*

(12) UL Subject 2436, *Spill Containment For Stationary Lead Acid Battery Systems*

(13) UL ~~Subject~~ 9540, *Safety of Energy Storage Systems and Equipment*

(14) <u>UL Subject 1974, Standard for Evaluation of Repurposed Batteries</u>

Statement of Problem and Substantiation for Public Input

NFPA Standard 855, which covers the installation of ESS and does reference the NEC for issues within the scope of the NEC, is under development and is on a track for completion in June 2018, which although is after the date of this PI phase it is expected to be available by the time this code cycle is complete. The importance of ensuring that batteries are safe cannot be understated. For many years UL 1973 has provided a 'metric' by which batteries can be documented and verified as safe. With increased demand for batteries and to address energy, economic and environmental challenges batteries are being repurposed to facilitate their 'second use'. UL 1974 provides a 'metric' by which second-use batteries can be documented and verified as safe. This is especially important when considering replacement of batteries in ESS that are already installed. Similar to NFPA 855 this standard is under development and if completed in time then this change provides an opportunity to have it considered for the 2020, as opposed to the 2023, NEC.

This PI was developed by the PV Industry Forum (PVIF). For a description of the PVIF, please see PI-2751

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Public Input No. 2852-NFPA 70-2017 [Section No. 706.1]

706.1 Scope.

This article applies to all permanently installed energy storage systems (ESS) ~~operating at over 50 volts ac or 60 volts dc that~~ installed as a single component or grouped together total greater than 3.6 MJ (1 KWh). Energy storage systems may be stand-alone or interactive with other electric power production sources.

Informational Note No. 1 : For batteries rated in Amp-Hours, KWh is equal to the nominal rated voltage times amp-hour rating divided by 1000.

Informational Note No. 2: The following standards are frequently referenced for the installation of energy storage systems:

(1) NFPA 111-2013, *Standard on Stored Electrical Energy Emergency and Standby Systems*

(2) IEEE 484-2008, *Recommended Practice for Installation Design and Installation of Vented Lead-Acid Batteries for Stationary Applications*

(3) IEEE 485-1997, *Recommended Practice for Sizing Vented Lead-Acid Storage Batteries for Stationary Applications*

(4) IEEE 1145-2007, *Recommended Practice for Installation and Maintenance of Nickel-Cadmium Batteries for Photovoltaic (PV) Systems*

(5) IEEE 1187-2002, *Recommended Practice for Installation Design, and Installation of Valve-Regulated Lead-Acid Batteries for Stationary Applications*

(6) IEEE 1578-2007, *Recommended Practice for Stationary Battery Electrolyte Spill Containment and Management*

(7) IEEE 1635/ASHRAE 21-2012, *Guide for the Ventilation and Thermal Management of Batteries for Stationary Applications*

(8) UL 810A, *Electrochemical Capacitors*

(9) UL 1973, *Batteries for Use in Light Electric Rail (LER) Applications and Stationary Applications*

(10) UL 1989, *Standard for Standby Batteries*

(11) UL Subject 2436, *Spill Containment For Stationary Lead Acid Battery Systems*

(12) UL Subject 9540, *Safety of Energy Storage Systems and Equipment*

Statement of Problem and Substantiation for Public Input

Article 706 covers permanently installed energy storage systems (ESS) regardless of capacity. An unintended gap exists in the application of this article to systems that operate below voltages of 50Vac and 60Vdc. Large systems below these voltage values are prevalent and have been installed in buildings for many years both as stand-alone systems and interactive systems. A change is needed in 706.1 to ensure 706 applies to all appropriate ESS applications.

We propose eliminating voltage limits and replacing an energy capacity limit. An energy limit better aligns with the unique qualities of ESS. This 1 KWh value aligns with ESS limits in updated building and fire codes. It provides a practical limit to ensure 706 covers dedicated ESS applications with an exemption for small storage applications commonly used for utilization equipment such as alarms. 1 KWh is slightly greater than two 12V, 40 Ah batteries.

A grouping reference ensures that 706 is used in larger capacity applications utilizing multiple smaller units. Though the term “grouped” is not defined in the Code, it is frequently used where specific physical distances are impractical. The units used align with those in other codes while not specifically referenced in the 2015 NEC Style Manual.

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Public Input No. 2957-NFPA 70-2017 [Section No. 706.1]

706.1 Scope.

This article applies to all permanently installed energy storage systems (ESS) operating at over 50 volts ac or 60 volts dc that may be stand-alone or interactive with other electric power production sources. <u>These systems are intended to store and provide energy during normal operation.</u>

Informational Note: The following standards are frequently referenced for the installation of energy storage systems:

(1) NFPA 111-2013, *Standard on Stored Electrical Energy Emergency and Standby Systems*

(2) IEEE 484-2008, *Recommended Practice for Installation Design and Installation of Vented Lead-Acid Batteries for Stationary Applications*

(3) IEEE 485-1997, *Recommended Practice for Sizing Vented Lead-Acid Storage Batteries for Stationary Applications*

(4) IEEE 1145-2007, *Recommended Practice for Installation and Maintenance of Nickel-Cadmium Batteries for Photovoltaic (PV) Systems*

(5) IEEE 1187-2002, *Recommended Practice for Installation Design, and Installation of Valve-Regulated Lead-Acid Batteries for Stationary Applications*

(6) IEEE 1578-2007, *Recommended Practice for Stationary Battery Electrolyte Spill Containment and Management*

(7) IEEE 1635/ASHRAE 21-2012, *Guide for the Ventilation and Thermal Management of Batteries for Stationary Applications*

(8) UL 810A, *Electrochemical Capacitors*

(9) UL 1973, *Batteries for Use in Light Electric Rail (LER) Applications and Stationary Applications*

(10) UL 1989, *Standard for Standby Batteries*

(11) UL Subject 2436, *Spill Containment For Stationary Lead Acid Battery Systems*

(12) UL Subject 9540, *Safety of Energy Storage Systems and Equipment*

Statement of Problem and Substantiation for Public Input

This public input is the result of an Energy Storage Task Group that was put together by CMP 13 to correlate Article 706, Energy Storage Systems and Article 480, Batteries. Various sections between the two articles were redundant while certain sections in Article 706 strictly pertained to batteries and were better suited in the Battery article. It was also the charge of the task group to better define Energy Storage Systems. The Task Group members were Larry Ayer, Jim Dollard, Dan Neeser, Mario Spina, Tim Croushore, Bill Cantor, Chad Kennedy, Steve Froemming, John Kovacik and Dan Caron.

This specific public input is editorial and seeks to better define the scope of Article 706. In the previous cycle an Energy Storage System may have been confused with a UPS system or a large battery system that is used only when power is lost to the building. The revised definition provides additional clarity that an ESS can store and provide energy during normal operating conditions.

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Public Input No. 3249-NFPA 70-2017 [Section No. 706.1]

706.1 Scope.

This article applies to all permanently installed energy storage systems (ESS) operating at over 50 volts ac or 60 volts dc that may be stand-alone or interactive with other electric power production sources.

Informational Note: The following standards are frequently referenced for the installation of energy storage systems:

(1) NFPA 111-2013, *Standard on Stored Electrical Energy Emergency and Standby Systems*

(2) IEEE 484-2008, *Recommended Practice for Installation Design and Installation of Vented Lead-Acid Batteries for Stationary Applications*

(3) IEEE 485-1997, *Recommended Practice for Sizing Vented Lead-Acid Storage Batteries for Stationary Applications*

(4) IEEE 1145-2007, *Recommended Practice for Installation and Maintenance of Nickel-Cadmium Batteries for Photovoltaic (PV) Systems*

(5) IEEE 1187-2002, *Recommended Practice for Installation Design, and Installation of Valve-Regulated Lead-Acid Batteries for Stationary Applications*

(6) IEEE 1578-2007, *Recommended Practice for Stationary Battery Electrolyte Spill Containment and Management*

(7) IEEE 1635/ASHRAE 21-2012, *Guide for the Ventilation and Thermal Management of Batteries for Stationary Applications*

(8) UL 810A, *Electrochemical Capacitors*

(9) UL 1973, *Batteries for Use in Light Electric Rail (LER) Applications and Stationary Applications*

(10) UL 1989, *Standard for Standby Batteries*

(11) UL Subject 2436, *Spill Containment For Stationary Lead Acid Battery Systems*

(12) UL ~~Subject 9540~~ 9540 , *Safety of Energy Storage Systems and Equipment*

Statement of Problem and Substantiation for Public Input

UL 9540 is now an ANSI/CAN Bi-national safety standard for the USA and Canada and no longer an Outline of Investigation. Therefore, the Subject before the number should be removed.

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I, Laurie Florence, 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. 3262-NFPA 70-2017 [Section No. 706.1]

706.1 Scope.

This article applies to all permanently installed energy storage systems (ESS) operating at over 50 volts ac or ~~60 volts~~ no less than 48 volts dc that may be stand-alone or interactive with other electric power production sources.

Informational Note: The following standards are frequently referenced for the installation of energy storage systems:

(1) NFPA 111-2013, *Standard on Stored Electrical Energy Emergency and Standby Systems*

(2) IEEE 484-2008, *Recommended Practice for Installation Design and Installation of Vented Lead-Acid Batteries for Stationary Applications*

(3) IEEE 485-1997, *Recommended Practice for Sizing Vented Lead-Acid Storage Batteries for Stationary Applications*

(4) IEEE 1145-2007, *Recommended Practice for Installation and Maintenance of Nickel-Cadmium Batteries for Photovoltaic (PV) Systems*

(5) IEEE 1187-2002, *Recommended Practice for Installation Design, and Installation of Valve-Regulated Lead-Acid Batteries for Stationary Applications*

(6) IEEE 1578-2007, *Recommended Practice for Stationary Battery Electrolyte Spill Containment and Management*

(7) IEEE 1635/ASHRAE 21-2012, *Guide for the Ventilation and Thermal Management of Batteries for Stationary Applications*

(8) UL 810A, *Electrochemical Capacitors*

(9) UL 1973, *Batteries for Use in Light Electric Rail (LER) Applications and Stationary Applications*

(10) UL 1989, *Standard for Standby Batteries*

(11) UL Subject 2436, *Spill Containment For Stationary Lead Acid Battery Systems*

(12) UL Subject 9540, *Safety of Energy Storage Systems and Equipment*

Additional Proposed Changes

File Name	Description	Approved
855_Scope_table.pdf	NFPA 855 Scope table	✓

Statement of Problem and Substantiation for Public Input

The requirements for battery storage systems were removed from 690 and moved to 706. But most of the battery systems covered by 690 were rated for 48Vdc or less. By limiting the DC voltage rating of systems covered by 706 to 60Vdc and above we have removed requirements for most residential and small commercial battery systems from the NEC. I proposed that 706 be modified to cover at least 48Vdc and above systems.
There should also be kWhr specifications as there are in the new 855 NFPA standard. See attached pdf of 855 table 1.3.

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Table 1.3 Stationary ESS Threshold Quantities

ESS Technology	Aggregate Capacity[a]	
	kWh	**MJ**
Battery ESS		
Lead acid, all types	70	252
Nickel-cadmium (Ni-Cd)	70	252
Lithium-ion, all types	20	72
Sodium, all types	20[c]	72[c]
Flow batteries[b]	20	72
Other battery technologies	10	36
Batteries in residential occupancies	1	3.6
Capacitor ESS		
Capacitors, all types	3	10.8
Other ESS		
All other ESS	70	252

[a]For ESS units rated in amp-hrs, kWh equals rated voltage times amp-hr rating divided by 1000.

[b]Includes vanadium, zinc-bromine, polysulfide-bromide, and other flowing electrolyte-type technologies.

[c]Values for sodium-ion technologies are 70 kWh (252 MJ).

Public Input No. 3706-NFPA 70-2017 [Section No. 706.1]

706.1 Scope.

This article applies to all ~~permanently installed~~ energy storage systems (ESS) operating at over

~~50 volts~~
50 volts ac or

~~60 volts~~
60 volts dc that may be stand-alone or interactive with other electric power production sources.

Informational Note: The following standards are frequently referenced for the installation of energy storage systems:

(1) NFPA 111-2013, *Standard on Stored Electrical Energy Emergency and Standby Systems*

(2) IEEE 484-2008, *Recommended Practice for Installation Design and Installation of Vented Lead-Acid Batteries for Stationary Applications*

(3) IEEE 485-1997, *Recommended Practice for Sizing Vented Lead-Acid Storage Batteries for Stationary Applications*

(4) IEEE 1145-2007, *Recommended Practice for Installation and Maintenance of Nickel-Cadmium Batteries for Photovoltaic (PV) Systems*

(5) IEEE 1187-2002, *Recommended Practice for Installation Design, and Installation of Valve-Regulated Lead-Acid Batteries for Stationary Applications*

(6) IEEE 1578-2007, *Recommended Practice for Stationary Battery Electrolyte Spill Containment and Management*

(7) IEEE 1635/ASHRAE 21-2012, *Guide for the Ventilation and Thermal Management of Batteries for Stationary Applications*

(8) UL 810A, *Electrochemical Capacitors*

(9) UL 1973, *Batteries for Use in Light Electric Rail (LER) Applications and Stationary Applications*

(10) UL 1989, *Standard for Standby Batteries*

(11) UL Subject 2436, *Spill Containment For Stationary Lead Acid Battery Systems*

(12) UL Subject 9540, *Safety of Energy Storage Systems and Equipment*

Additional Proposed Changes

File Name	Description	Approved
Portable_ESS_11.jpg	Temporary ESS example	
Portable_ESS_9.jpg	Temporary ESS example 2	
Portable_ESS_8.jpg	Temporary ESS example 3	
Portable_ESS_7.jpg	Temporary ESS example 4	
Portable_ESS_6.jpg	Temporary ESS example 5	

Statement of Problem and Substantiation for Public Input

As currently written, Article 706 only applies to permanently installed energy storage systems (ESS). ESS are being installed and used as temporary power systems for concerts, carnivals, community festivals as well as temporary power for natural disasters such as Hurricane Harvey. When installed as a temporary power system, the ESS poses the same fire and shock hazard as one installed permanently. Because of their mobility and reuse the ESS would be subjected to unknowns such as physical abuse and should not be excluded from the requirements in Article 706. Additionally, there is a current task group working on submitting proposals to the International Fire Code as well as NFPA 1 to address mobile/temporary ESS applications such as identifying acceptable and prohibited installation locations, smoke and fire detection and a requirement that electrical connections shall be made in accordance with NFPA 70. However as stated above, as currently written, Article 706 excludes temporary/mobile ESS from the requirements.

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Public Input No. 3816-NFPA 70-2017 [Section No. 706.1]

706.1 Scope.

This article applies to all permanently installed energy storage systems (ESS) operating at over 50 volts ac or over 60 volts dc that may be stand-alone or interactive with other electric power production sources.

Informational Note: The following standards are frequently referenced for the installation of energy storage systems:

(1) NFPA 111-2013, *Standard on Stored Electrical Energy Emergency and Standby Systems*

(2) IEEE 484-2008, *Recommended Practice for Installation Design and Installation of Vented Lead-Acid Batteries for Stationary Applications*

(3) IEEE 485-1997, *Recommended Practice for Sizing Vented Lead-Acid Storage Batteries for Stationary Applications*

(4) IEEE 1145-2007, *Recommended Practice for Installation and Maintenance of Nickel-Cadmium Batteries for Photovoltaic (PV) Systems*

(5) IEEE 1187-2002, *Recommended Practice for Installation Design, and Installation of Valve-Regulated Lead-Acid Batteries for Stationary Applications*

(6) IEEE 1578-2007, *Recommended Practice for Stationary Battery Electrolyte Spill Containment and Management*

(7) IEEE 1635/ASHRAE 21-2012, *Guide for the Ventilation and Thermal Management of Batteries for Stationary Applications*

(8) UL 810A, *Electrochemical Capacitors*

(9) UL 1973, *Batteries for Use in Light Electric Rail (LER) Applications and Stationary Applications*

(10) UL 1989, *Standard for Standby Batteries*

(11) UL Subject 2436, *Spill Containment For Stationary Lead Acid Battery Systems*

(12) UL Subject 9540, *Safety of Energy Storage Systems and Equipment*

Statement of Problem and Substantiation for Public Input

Just clarifying that the DC voltage should be greater than the value given and not exactly the value given, to match the way the AC value is treated.

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Public Input No. 2246-NFPA 70-2017 [Section No. 706.2]

706.2 Definitions.

~~**Battery.**~~

~~Two or more cells connected together electrically in series, in parallel, or a combination of both to provide the required operating voltage and current levels.~~

~~**Cell.**~~

~~The basic electrochemical unit, characterized by an anode and a cathode, used to receive, store, and deliver electrical energy.~~

~~**Container.**~~

~~A vessel that holds the plates, electrolyte, and other elements of a single unit, comprised of one or more cells, in a battery. It can be referred to as a jar or case.~~

~~**Diversion Charge Controller.**~~

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

~~**Electrolyte.**~~

~~The medium that provides the ion transport mechanism between the positive and negative electrodes of a cell~~

(A) Application Within this Article and throughout the Code. The following definition shall apply within this article and throughout the code .

Energy Storage System (ESS).

One or more components assembled together capable of storing energy for use at a future time. ESS(s) can include but is not limited to batteries, capacitors, and kinetic energy devices (e.g., flywheels and compressed air). These systems can have ac or dc output for utilization and can include inverters and converters to change stored energy into electrical energy.

Energy Storage System, Self-Contained.

Energy storage systems where the components such as cells, batteries, or modules and any necessary controls, ventilation, illumination, fire suppression, or alarm systems are assembled, installed, and packaged into a singular energy storage container or unit.

> Informational Note: Self-contained systems will generally be manufactured by a single entity, tested and listed to safety standards relevant to the system, and readily connected on site to the electrical system and in the case of multiple systems to each other.

Energy Storage System, Pre-Engineered of Matched Components.

Energy storage systems that are not self-contained systems but instead are pre-engineered and field-assembled using separate components supplied as a system by a singular entity that are matched and intended to be assembled as an energy storage system at the system installation site.

> Informational Note: Pre-engineered systems of matched components for field assembly as a system will generally be designed by a single entity and comprised of components that are tested and listed separately or as an assembly.

Energy Storage System, Other.

Energy storage systems that are not self-contained or pre-engineered systems of matched components but instead are composed of individual components assembled as a system.

> Informational Note: Other systems will generally be comprised of different components combined on site to create an ESS. Those components would generally be tested and listed to safety standards relevant to the application.

(B) Application Within this Article. The following definition shall apply only within this article.

Battery.

Two or more cells connected together electrically in series, in parallel, or a combination of both to provide the required operating voltage and current levels.

Cell.

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

Container.

A vessel that holds the plates, electrolyte, and other elements of a single unit, comprised of one or more cells, in a battery. It can be referred to as a jar or case.

Diversion Charge Controller.

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

Electrolyte.

The medium that provides the ion transport mechanism between the positive and negative electrodes of a cell.

Flow Battery.

An energy storage component similar to a fuel cell that stores its active materials in the form of two electrolytes external to the reactor interface. When in use, the electrolytes are transferred between reactor and storage tanks.

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

Intercell Connector.

An electrically conductive bar or cable used to connect adjacent cells.

Intertier Connector.

In a battery system, an electrical conductor used to connect two cells on different tiers of the same rack or different shelves of the same rack.

Inverter Input Circuit.

Conductors between the inverter and the ESS in stand-alone and multimode inverter systems.

Inverter Output Circuit.

Conductors between the inverter and another electric power production source, such as a utility for an electrical production and distribution network.

Inverter Utilization Output Circuit.

Conductors between the multimode or standalone inverter and utilization equipment.

Nominal Voltage (Battery or Cell).

The value assigned to a cell or battery of a given voltage class for the purpose of convenient designation. The operating voltage of the cell or battery may vary above or below this value.

Sealed Cell or Battery.

A cell or battery that has no provision for the routine addition of water or electrolyte or for external measurement of electrolyte specific gravity.

> Informational Note: Some cells that are considered to be sealed under conditions of normal use, such as valve-regulated lead-acid or some lithium cells, contain pressure relief valves.

Terminal.

That part of a cell, container, or battery to which an external connection is made (commonly identified as a post, pillar, pole, or terminal post).

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

Related Public Inputs for This Document

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

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Public Input No. 2981-NFPA 70-2017 [Section No. 706.2]

706.2 Definitions.

~~**Battery.**~~

~~Two or more cells connected together electrically in series, in parallel, or a combination of both to provide the required operating voltage and current levels.~~

~~**Cell.**~~

~~The basic electrochemical unit, characterized by an anode and a cathode, used to receive, store, and deliver electrical energy.~~

~~**Container.**~~

~~A vessel that holds the plates, electrolyte, and other elements of a single unit, comprised of one or more cells, in a battery. It can be referred to as a jar or case.~~

Diversion Charge Controller.

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

~~**Electrolyte.**~~

~~The medium that provides the ion transport mechanism between the positive and negative electrodes of a cell.~~

Energy Storage System (ESS).

One or more components assembled together capable of storing energy for use at a future time. ESS(s) can include but is not limited to batteries, capacitors, and kinetic energy devices (e.g., flywheels and compressed air). These systems can have ac or dc output for utilization and can include inverters and converters to change stored energy into electrical energy.

Energy Storage System, Self-Contained.

Energy storage systems where the components such as cells, batteries, or modules and any necessary controls, ventilation, illumination, fire suppression, or alarm systems are assembled, installed, and packaged into a singular energy storage container or unit.

> Informational Note: Self-contained systems will generally be manufactured by a single entity, tested and listed to safety standards relevant to the system, and readily connected on site to the electrical system and in the case of multiple systems to each other.

Energy Storage System, Pre-Engineered of Matched Components.

Energy storage systems that are not self-contained systems but instead are pre-engineered and field-assembled using separate components supplied as a system by a singular entity that are matched and intended to be assembled as an energy storage system at the system installation site.

> Informational Note: Pre-engineered systems of matched components for field assembly as a system will generally be designed by a single entity and comprised of components that are tested and listed separately or as an assembly.

Energy Storage System, Other.

Energy storage systems that are not self-contained or pre-engineered systems of matched components but instead are composed of individual components assembled as a system.

> Informational Note: Other systems will generally be comprised of different components combined on site to create an ESS. Those components would generally be tested and listed to safety standards relevant to the application.

Flow Battery.

An energy storage component similar to a fuel cell that stores its active materials in the form of two electrolytes external to the reactor interface. When in use, the electrolytes are transferred between reactor and storage tanks.

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

~~**Intercell Connector.**~~

~~An electrically conductive bar or cable used to connect adjacent cells.~~

~~**Intertier Connector.**~~

~~In a battery system, an electrical conductor used to connect two cells on different tiers of the same rack or different shelves of the same rack.~~

Inverter ~~Input Circuit.~~

~~Conductors between the inverter and the ESS in stand-alone and multimode inverter systems.~~

~~**Inverter Output Circuit.**~~

~~Conductors between the inverter and another electric power production source, such as a utility for an electrical production and distribution network.~~

~~Inverter~~ **Utilization Output Circuit.**

Conductors between the multimode or standalone inverter and utilization equipment.

~~**Nominal Voltage (Battery or Cell).**~~

~~The value assigned to a cell or battery of a given voltage class for the purpose of convenient designation. The operating voltage of the cell or battery may vary above or below this value.~~

~~**Sealed Cell or Battery.**~~

~~A cell or battery that has no provision for the routine addition of water or electrolyte or for external measurement of electrolyte specific gravity.~~

~~Informational Note: Some cells that are considered to be sealed under conditions of normal use, such as valve-regulated lead-acid or some lithium cells, contain pressure relief valves.~~

~~**Terminal.**~~

~~That part of a cell, container, or battery to which an external connection is made (commonly identified as a post, pillar, pole, or terminal post).~~

Statement of Problem and Substantiation for Public Input

This public input is the result of an Energy Storage Task Group that was put together by CMP 13 to correlate Article 706, Energy Storage Systems and Article 480, Batteries. Various sections between the two articles were redundant while certain sections in Article 706 strictly pertained to batteries and were better suited in the Battery article. It was also the charge of the task group to better define Energy Storage Systems. The Task Group members were Larry Ayer, Jim Dollard, Dan Neeser, Mario Spina, Tim Croushore, Bill Cantor, Chad Kennedy, Steve Froemming, John Kovacik and Dan Caron.

This specific public input removed redundant definitions between the two articles and relocated definitions for batteries out of 706.

1. "Battery" is relocated to 480.2.
2. "Cell" and "Container" are being deleted since these are covered in 480.2
3. "Electrolyte" is being deleted since this is covered in 480.2.
4. "Intercell Connection", "Intertier Connector", Nominal Voltage (Battery or Cell), "Sealed Cell or Battery", and "Terminal" are being deleted since these are covered in 480.2.
5. "Inverter Input Circuit" and Inverter Output Circuit" are being deleted since these terms are defined in Article 690.
6. While the public input shows the addition of an "Inverter Utilization Output Circuit" definition, this term already exists and Terraview underlined the definition in error.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2950-NFPA 70-2017 [Section No. 480.2]	Adds definition of Battery to 480.2.

Submitter Information Verification

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Public Input No. 2753-NFPA 70-2017 [Section No. 706.3]

~~**706.3** Other Articles.~~

~~Wherever the requirements of other articles of this *Code* and Article 706 differ, the requirements of Article 706 shall apply. If the ESS is capable of being operated in parallel with a primary source(s) of electricity, the requirements in 705.6 , 705.12 , 705.14 , 705.16 , 705.32 , 705.40 , 705.100 , 705.143 , and Part IV of Article 705 shall apply.~~

Statement of Problem and Substantiation for Public Input

There is no need to reference other articles that are applicable. Section 90.3 clearly states how the NEC is to be used.

This PI was developed by the PV Industry Forum (PVIF). For a description of the PVIF, please see PI-2751

Submitter Information Verification

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Public Input No. 2755-NFPA 70-2017 [Section No. 706.4]

706.4 System Classification.

ESS shall be classified as one of the types described as follows:

(1) ESS, self-contained

~~Informational Note: Some self-contained systems may be listed.~~

(2) ESS, pre-engineered of matched components

(3) ESS, other

Statement of Problem and Substantiation for Public Input

Proposed change is aligned with PI-2754 to make listing a requirement for all self-contained ESS.

This PI was developed by the PV Industry Forum (PVIF). For a description of the PVIF, please see PI-2751

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2754-NFPA 70-2017 [Section No. 706.5]	
Public Input No. 2776-NFPA 70-2017 [Definition: Energy Storage System, Self-Contained.]	

Submitter Information Verification

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Public Input No. 3415-NFPA 70-2017 [Section No. 706.4]

706.4 System Classification and Marking Requirements .

~~ESS~~ (A) Classification. ESS shall be classified as one of the types described as follows:

(1) ESS, self-contained

Informational Note: Some self-contained systems may be listed.

(2) ESS, pre-engineered of matched components

(3) ESS, other

(B) Marking. Each ESS shall be provided with a nameplate plainly visible after installation having the following information:

(1) Manufacturer's name, trademark, or other descriptive marking by which the organization responsible for supplying the ESS can be identified.

(2) Rated frequency

(3) Number of phases, if AC

(4) Rating (kW or kVA)

(5) Nominal voltage and amperes

(6) Maximum fault-current derived by the ESS at the output terminals

(7) Utility-interactive capability, if applicable.

Statement of Problem and Substantiation for Public Input

This public input is the result of an Energy Storage Task Group that was put together by CMP 13 to correlate Article 706, Energy Storage Systems and Article 480, Batteries. Various sections between the two articles were redundant while certain sections in Article 706 strictly pertained to batteries and were better suited in the Battery article. It was also the charge of the task group to better define Energy Storage Systems. The Task Group members were Larry Ayer, Jim Dollard, Dan Neeser, Mario Spina, Tim Croushore, Bill Cantor, Chad Kennedy, Steve Froemming, John Kovacik and Dan Caron.

It is important that a Energy Storage System be marked with specific information for the installer. This specific public input provides a marking requirement that correlates with the marking requirements found within UL 9540.

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Public Input No. 3838-NFPA 70-2017 [Section No. 706.4]

706.4 System Classification.

ESS shall be classified as one of the types described as follows:

(1) ESS, self-contained

Informational Note: Some self-contained systems may be listed.

(2) ESS, pre-~~engineered of matched components~~ engineered

(3) ESS, other

Statement of Problem and Substantiation for Public Input

I know of no definition for "matched components" or other usage in the NEC but I assume this is intended to mean components that are intended to work together. Since I can't imagine a company putting together a pre-engineered system out of unmatched components, or how someone would determine if the components in a pre-engineered system were matched or not the text should be deleted as unenforceable.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3840-NFPA 70-2017 [Definition: Energy Storage System, Pre-Engineered of Matche...]	Go together
Public Input No. 3842-NFPA 70-2017 [Section No. 706.20(A)(1)]	Go together

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Public Input No. 2754-NFPA 70-2017 [Section No. 706.5]

706.5 Equipment.

Monitors, controls, switches, fuses, circuit breakers, power conversion systems, inverters and transformers, energy storage ~~components~~ devices , and other components of the energy storage system other than lead-acid batteries, shall be listed. ~~Alternatively, self~~ Self -contained ESS shall be listed as a complete energy storage system.

Statement of Problem and Substantiation for Public Input

The deletion of the word "alternately" from the requirements of 706.5 clarifies that an ESS meeting the definition of "Energy Storage System, Self-Contained" in 706.2 must be listed. The term energy storage components is replaced with energy storage devices to clarify that the storage media should be listed, and to eliminate the potentially confusing dual use of the term components.

Self-contained ESS that are listed as a unitary complete system by a NRTL to UL 9540 should not be subject to further inspections of wiring, controls, and other components of the ESS that are addressed in UL 9540 and the associated listing. This is supported through Section 90.7 "…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…"
This clarification will help AHJs in the inspection process determine the boundaries of required field inspections for self-contained ESS.

This PI was developed by the PV Industry Forum (PVIF). For a description of the PVIF, please see PI-2751

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2755-NFPA 70-2017 [Section No. 706.4]	
Public Input No. 2776-NFPA 70-2017 [Definition: Energy Storage System, Self-Contained.]	

Submitter Information Verification

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Public Input No. 2870-NFPA 70-2017 [Section No. 706.7]

706.7 Disconnecting Means.

(A) ESS Disconnecting Means.

A disconnecting means shall be provided for all ungrounded conductors derived from an ESS. A disconnecting means shall be readily accessible and located within sight of the ESS. The disconnecting means is permitted to be integral to listed ESS equipment.

Informational Note: See 240.21(H) for information on the location of the overcurrent device for conductors.

(B) Remote Actuation.

Where controls to activate the disconnecting means of an ESS are not located within sight of the system, the disconnecting means shall be capable of being locked in the open position, in accordance with 110.25, and the location of the controls shall be field marked on the disconnecting means.

(C) Busway.

Where a dc busway system is installed, the disconnecting means shall be permitted to be incorporated into the busway.

(D) Notification.

The disconnecting means shall be legibly marked in the field. The marking shall meet the requirements of 110.21(B) and shall include the following:

(1) Nominal ESS voltage

(2) Maximum available short-circuit current derived from the ESS

(3) The associated clearing time or arc duration based on the available short-circuit current from the ESS and associated overcurrent protective devices if applicable

(4) Date the calculation was performed

Exception: The labeling in 706.7(D)(1) through (D)(4) shall not be required if an arc flash label is applied in accordance with acceptable industry practice.

Informational Note No. 1: 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. 2: Battery equipment suppliers can provide information about short-circuit current on any particular battery model.

(E) Partitions and Distance.

Where energy storage system input and output terminals are more than 1.5 m (5 ft) from connected equipment, or where the circuits from these terminals pass through a wall or partition, the installation shall comply with the following:

(1) A disconnecting means shall be provided at the energy storage system end of the circuit. Fused disconnecting means or circuit breakers shall be permitted to be used.

(2) A second disconnecting means located at the connected equipment shall be installed where the disconnecting means required by 706.7(E)(1) is not within sight of the connected equipment.

Informational Note No. 1: For remote disconnect controls in information technology equipment rooms, see 645.10.

Informational Note No. 2: For overcurrent protection of batteries, see 240.21(H).

(3) Where fused disconnecting means are used, the line terminals of the disconnecting means shall be connected toward the energy storage system terminals.

(4) Disconnecting means shall be permitted to be installed in energy storage system enclosures where explosive atmospheres can exist if listed for hazardous locations.

(5) Where the disconnecting means in (1) is not within sight of the disconnecting means in (2), placards or directories shall be installed at the locations of all disconnecting means indicating the location of all other disconnecting means.

Statement of Problem and Substantiation for Public Input

Statement of Problem:
Existing language might give the impression that an additional disconnecting means would need to be installed even when a means is provided within a listed ESS systems.

Substantiation:
Provisions for disconnecting means that are integral to listed ESS systems should be provided.

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Public Input No. 2959-NFPA 70-2017 [Section No. 706.7]

Part II. Disconnecting Means

706.7 Disconnecting Means.

(A) ESS Disconnecting Means.

~~A disconnecting means shall be provided for all ungrounded conductors derived from an ESS. A disconnecting means shall be readily accessible and located within sight of the ESS.~~

~~Informational Note: See 240.21(H) for information on the location of the overcurrent device for conductors.~~

ESS exceeding 100 volts between conductors or to ground shall have a disconnecting means, accessible only to qualified persons, that disconnects ungrounded and grounded circuit conductor(s) in the electrical storage system for maintenance. This disconnecting means shall not disconnect the grounded circuit conductor(s) for the remainder of any other electrical system. A non–load-break-rated switch shall be permitted to be used as a disconnecting means.

(B) Remote Actuation.

Where controls to activate the disconnecting means of an ESS are not located within sight of the system, the disconnecting means shall be capable of being locked in the open position, in accordance with 110.25, and the location of the controls shall be field marked on the disconnecting means.

(C) ~~Busway.~~

~~Where a dc busway system is installed, the disconnecting means shall be permitted to be incorporated into the busway.~~

~~**(D)** Notification.~~

~~The disconnecting means shall be legibly marked in the field. The marking shall meet the requirements of 110.21(B) and shall include the following:~~

(1) ~~Nominal ESS voltage~~

(2) ~~Maximum available short-circuit current derived from the ESS~~

(3) ~~The associated clearing time or arc duration based on the available short-circuit current from the ESS and associated overcurrent protective devices if applicable~~

(4) ~~Date the calculation was performed~~

~~*Exception: The labeling in 706.7(D)(1) through (D)(4) shall not be required if an arc flash label is applied in accordance with acceptable industry practice.*~~

~~Informational Note No. 1: 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. 2: Battery equipment suppliers can provide information about short-circuit current on any particular battery model.~~

~~**(E)** Partitions and Distance.~~

Location of Disconnecting Means .

Where energy storage system input and output terminals are more than 1.5 m (5 ft) from connected equipment, or where the circuits from these terminals pass through a wall or partition, the installation shall comply with the following:

(1) A disconnecting means shall be provided at the energy storage system end of the circuit. Fused disconnecting means or circuit breakers shall be permitted to be used.

(2) A second disconnecting means located at the connected equipment shall be installed where the disconnecting means required by 706.7(E)(1) is not within sight of the connected equipment.

Informational Note No. 1: For remote disconnect controls in information technology equipment rooms, see 645.10.

Informational Note No. 2: For overcurrent protection of batteries, see 240.21(H).

(3) Where fused disconnecting means are used, the line terminals of the disconnecting means shall be connected toward the energy storage system terminals.

(4) Disconnecting means shall be permitted to be installed in energy storage system enclosures where explosive atmospheres can exist if listed for hazardous locations.

(5) Where the disconnecting means in (1) is not within sight of the disconnecting means in (2), placards or directories shall be installed at the locations of all disconnecting means indicating the location of all other disconnecting means.

(D) Disconnect Marking.

The disconnecting means shall be ledgibly marked in the field. The marking shall meet the requirements of 110.21(B) and shall include the following:

(1) An arc flash label applied in accordance with acceptable industry practice.

(2) Date the label and calculation was applied.

Informational Note No. 1: 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 specific public input is editorial and seeks to improve clarity with regard to section 706.7, Disconnecting Means.

1. "Part II. Disconnecting Means" is added to this section to provide improved delineation between sections within article 706.

2. Section 706.7(A) is redefined for systems that exceed 100 volts and is relocated from 706.30(C).

3. 706.7(C) and (D) are deleted since these requirements are covered in Article 480 and pertain specifically to batteries.

4. 706.7(E) has been renumbered to 706.7(C) as a result of the deleted sections in item 3, and is renamed to "Location of Disconnecting Means" to provide increased clarity.

5. The Disconnecting Marking requirement has been revised to strictly require an arc flash label to be installed rather than the operating time of an overcurrent device. The fault current requirement has been relocated to 706.4 and is no longer required in this section.

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Public Input No. 3661-NFPA 70-2017 [Section No. 706.7]

Part II Disconnecting Means

706.7 Disconnecting Means.

(A) ESS Disconnecting Means.

~~A disconnecting means shall be provided for all ungrounded conductors derived from an ESS. A disconnecting means shall be readily accessible and located within sight of the ESS.~~

~~Informational Note: See 240.21(H) for information on the location of the overcurrent device for conductors.~~

ESS exceeding 100 volts between conductors or to ground shall have a disconnecting means, accessible only to qualified persons, that disconnects ungrounded and grounded circuit conductor(s) in the electrical storage system for maintenance. This disconnecting means shall not disconnect the grounded circuit conductor(s) for the remainder of any other electrical system. A non–load-break-rated switch shall be permitted to be used as a disconnecting means.

(B) Remote Actuation.

Where controls to activate the disconnecting means of an ESS are not located within sight of the system, the disconnecting means shall be capable of being locked in the open position, in accordance with 110.25, and the location of the controls shall be field marked on the disconnecting means.

~~**(D)**~~

(C) ~~Busway.~~

~~Where a dc busway system is installed, the disconnecting means shall be permitted to be incorporated into the busway.~~

Notification.

The disconnecting means shall be legibly marked in the field. The marking shall meet the requirements of 110.21(B) and shall include the following:

(1) Nominal ESS voltage

(2) Maximum available short-circuit current derived from the ESS

(3) The associated clearing time or arc duration based on the available short-circuit current from the ESS and associated overcurrent protective devices if applicable

(4) Date the calculation was performed

Exception: The labeling in 706.7(D)(1) through (D)(4) shall not be required if an arc flash label is applied in accordance with acceptable industry practice.

Informational Note No. 1: 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. 2: Battery equipment suppliers can provide information about short-circuit current on any particular battery model.

(~~E~~ D) ~~–~~ Partitions and Distance.

Where energy storage system input and output terminals are more than 1.5 m (5 ft) from connected equipment, or where the circuits from these terminals pass through a wall or partition, the installation shall comply with the following:

(1) A disconnecting means shall be provided at the energy storage system end of the circuit. Fused disconnecting means or circuit breakers shall be permitted to be used.

(2) A second disconnecting means located at the connected equipment shall be installed where the disconnecting means required by 706.7(E)(1) is not within sight of the connected equipment.

Informational Note No. 1: For remote disconnect controls in information technology equipment rooms, see 645.10.

Informational Note No. 2: For overcurrent protection of batteries, see 240.21(H).

(3) Where fused disconnecting means are used, the line terminals of the disconnecting means shall be connected toward the energy storage system terminals.

(4) Disconnecting means shall be permitted to be installed in energy storage system enclosures where explosive atmospheres can exist if listed for hazardous locations.

(5) Where the disconnecting means in (1) is not within sight of the disconnecting means in (2), placards or directories shall be installed at the locations of all disconnecting means indicating the location of all other disconnecting means.

Statement of Problem and Substantiation for Public Input

xxx

Submitter Information Verification

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Submittal Date: Wed Sep 06 16:19:21 EDT 2017

Public Input No. 2756-NFPA 70-2017 [Section No. 706.7(A)]

(A) ESS Disconnecting Means.

A disconnecting means shall be provided for all ungrounded conductors derived from an ESS. A disconnecting means shall be readily accessible and located within sight of the ESS.

~~Informational Note: See 240.21(H) for information on the location of the overcurrent device for conductors.~~

Statement of Problem and Substantiation for Public Input

Informational note is deleted because it does not belong in this section on Disconnecting Means and the intent is covered by 706.21(A).

This PI was developed by the PV Industry Forum (PVIF). For a description of the PVIF, please see PI-2751

Submitter Information Verification

Submitter Full Name:	Philip Undercuffler
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Submittal Date:	Fri Aug 25 17:34:54 EDT 2017

Public Input No. 3760-NFPA 70-2017 [Section No. 706.7(A)]

(A) ESS Disconnecting Means.

A disconnecting means shall be provided for all ungrounded conductors derived from an ESS. A disconnecting means shall be readily accessible and located within sight of the ESS.

For one-family and two-family dwellings, a disconnecting means or its remote control shall be located at a readily accessible location outside the building.

Informational Note: See 240.21(H) for information on the location of the overcurrent device for conductors.

Statement of Problem and Substantiation for Public Input

This public input addresses ongoing concerns expressed by the fire service and other first responders on the need to secure on-site power sources during emergencies and awareness of where those sources are. Effective means of securing utility sources have long been established by local fire departments however there is a lack of uniform procedures in how to effectively secure on-site power sources that may be at a premises due to the variety of different source types, the rapid rate of product adoption, and varied or absent Code language addressing notice and disconnection location of specific sources.

This proposed change is part of a grouping of proposals that will correlate various sections of the NEC and consistently require this important on-site source disconnecting switch to be located outside a one or two family dwelling regardless of whether the utility service equipment is located indoors or outdoors. This disconnecting switch will be marked on the warning placards also required to be located outdoors (see other PIs from this submitter) and will allow first responders to secure this on-site source prior to entering the building. Through our other PIs we propose a requirement that placards or directories showing the location of these switch(es) be located outdoors and grouped however we only propose requiring that the switch be readily accessible and located outdoors, without a specific requirement that it be grouped with other source disconnect switches. This is for practical purposes, especially when considering existing conditions. This should provide ready access by first responders to secure these sources prior to entering the dwelling since their outdoor location will be clearly marked on the required placards. This requirement as proposed is limited to one and two family dwellings since these buildings present unique challenges to fire departments.

This input has been developed and is supported by Tesla, who manufactures and installs both PV and energy storage equipment as well as Robert J. Davidson of Davidson Code Concepts. LLC. Complementary language is also being submitted by this team to fire and building Codes as appropriate in an attempt to harmonize these requirements across all relevant Codes.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3770-NFPA 70-2017 [Section No. 480.7(A)]	Requirements for external disconnects for batteries in 1&2 family dwellings
Public Input No. 3772-NFPA 70-2017 [Section No. 445.18(B)]	Requirements for external shutdown means for generators in excess of 15kW in 1&2 family dwellings.
Public Input No. 3780-NFPA 70-2017 [Section No. 694.22(C)(1)]	Requirements for external disconnects for wind generators in 1&2 family dwellings
Public Input No. 3783-NFPA 70-2017 [Section No. 692.13]	Requirements for external disconnects for fuel cells in 1&2 family dwellings

Submitter Information Verification

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Submittal Date: Wed Sep 06 20:35:28 EDT 2017

Copyright Assignment

Public Input No. 3832-NFPA 70-2017 [Section No. 706.7(A)]

(A) ESS Disconnecting Means.

A disconnecting means shall be provided for all ungrounded conductors derived from an ESS ~~.~~ and shall comply with the following:

(1) A disconnecting means shall be readily accessible and located within sight of the ESS.

(2) The line terminals of the disconnecting means shall be connected toward the ESS terminals.

(3) Disconnecting means shall be permitted to be installed in ESS enclosures where explosive atmospheres can exist if listed for hazardous locations.

Informational Note: See 240.21(H) for information on the location of the overcurrent device for conductors.

Statement of Problem and Substantiation for Public Input

Moved items (2) and (3) from (E) to here since they would seem to apply to all disconnecting means.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3830-NFPA 70-2017 [Section No. 706.7(E)]	Go together

Submitter Information Verification

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Submittal Date: Thu Sep 07 00:02:21 EDT 2017

Public Input No. 4210-NFPA 70-2017 [Section No. 706.7(A)]

(A) ESS Disconnecting Means.

A disconnecting means shall be provided for all ungrounded conductors derived from an ESS. ~~A~~ The disconnecting means shall be located in a readily accessible location, within sight and ~~located within sight~~ within 3 m (10") of the ESS. The disconnecting means shall be lockable open in accordance with 110.25 .

Informational Note: See 240.21(H) for information on the location of the overcurrent device for conductors.

Statement of Problem and Substantiation for Public Input

Having the required disconnect located with insight of the equipment provides a higher level of safety. The installers of ESSs are not always a licensed electrician with OSHA lockout tagout devices available.

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Submitter Full Name: Rhonda Parkhurst

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City:

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Submittal Date: Thu Sep 07 16:30:16 EDT 2017

Public Input No. 4206-NFPA 70-2017 [Section No. 706.7(B)]

~~**(B)** Remote Actuation.~~

~~Where controls to activate the disconnecting means of an ESS are not located within sight of the system, the disconnecting means shall be capable of being locked in the open position, in accordance with 110.25 , and the location of the controls shall be field marked on the disconnecting means.~~

Statement of Problem and Substantiation for Public Input

Section deleted not allowing the disconnect to be remote of the ESS. Having the required disconnect located with insight of the equipment provides a higher level of safety. The installers of ESSs are not always a licensed electrician with OSHA lockout tagout devices available.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 4210-NFPA 70-2017 [Section No. 706.7(A)]	

Submitter Information Verification

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Submittal Date: Thu Sep 07 16:27:19 EDT 2017

Public Input No. 1294-NFPA 70-2017 [Section No. 706.7(D)]

(D) Notification.

The disconnecting means shall be legibly marked in the field. The marking shall meet the requirements of 110.21(B) and shall include the following:

(1) Nominal ESS voltage

(2) ~~Maximum available short-circuit~~ Available fault current derived from the ESS

(3) The associated clearing time or arc duration based on the available ~~short-circuit~~ fault current from the ESS and associated overcurrent protective devices if applicable

(4) Date the calculation was performed

Exception: The labeling in 706.7(D)(1) through (D)(4) shall not be required if an arc flash label is applied in accordance with acceptable industry practice.

Informational Note No. 1: 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. 2: Battery equipment suppliers can provide information about ~~short-circuit~~ available fault current on any particular battery model.

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. 1249-NFPA 70-2017 [Section No. 110.24(A)]	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. 1295-NFPA 70-2017 [Section No. 712.65]	PI from Fault Current Working Group
Public Input No. 1297-NFPA 70-2017 [Definition: Feeder Neutral Conductor]	PI from Fault Current Working Group
Public Input No. 1296-NFPA 70-2017 [Section No. 712.72]	PI from Fault Current Working Group

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Public Input No. 2757-NFPA 70-2017 [Section No. 706.7(D)]

(D) Notification and Marking .

Each ESS disconnecting means shall plainly indicate whether it is in the open (off) or closed (on) position and be permanently marked “ENERGY STORAGE SYSTEM DISCONNECT.” The disconnecting means shall be legibly marked in the field ~~. The marking shall meet the requirements of 110.21(B) and shall include the~~ to indicate the following:

(1) Nominal ESS ac voltage and maximum ESS dc voltage

(2) Maximum available short-circuit current derived from the ESS

(3) The associated clearing time or arc duration based on the available short-circuit current from the ESS and associated overcurrent protective devices if applicable

(4) Date the calculation was performed

Exception: The labeling in 706.7(D)(1) through (D)(4) shall not be required if an arc flash label is applied in accordance with acceptable industry practice.

Informational Note No. 1: 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. 2: Battery equipment suppliers can provide information about short-circuit current on any particular battery model.

For ESS disconnecting means where the line and load terminals may be energized in the open position, the device shall be marked with the following words or equivalent:

WARNING

ELECTRIC SHOCK HAZARD

TERMINALS ON THE LINE AND LOAD

SIDES MAY BE ENERGIZED IN THE OPEN POSITION

These notification(s) and marking(s) shall comply with 110.21(B).

Statement of Problem and Substantiation for Public Input

The proposed changes address three concerns and are intended to harmonize this requirement with similar requirements for other power sources provided in the NEC. The ESS disconnecting means are to be clearly marked to better align with the requirements of 705.10, Directory of the locations for all power source disconnecting means. The voltage marking requirement is modified so the maximum dc voltage is marked (coordinated with the proposed change we have submitted to Part II for determining maximum voltage) and clarified to indicate that where an ESS has both ac and dc outputs they should both be indicated. Finally, the marking requirements related to line and load are to clearly indicate that both sides of a disconnect may be energized, as is likely to be common with energy storage systems with potential for bidirectional current flow.

This PI was developed by the PV Industry Forum (PVIF). For a description of the PVIF, please see PI-2751

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2761-NFPA 70-2017 [New Part after II.]	
Public Input No. 2762-NFPA 70-2017 [Section No. 706.30]	

Submitter Information Verification

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Submittal Date: Fri Aug 25 17:36:55 EDT 2017

Public Input No. 3413-NFPA 70-2017 [Section No. 706.7(D)]

(D) Notification.

The disconnecting means shall be legibly marked in the field. The marking shall meet the requirements of 110.21(B) and shall include the following:

(1) Nominal ESS voltage

(2) Maximum available short-circuit current derived from the ESS

(3) ~~The associated clearing time or arc duration based on the available short-circuit current from the ESS and associated overcurrent protective devices if applicable~~

(4) ~~Date the calculation was performed~~

~~Exception: The labeling in 706.7(D)(1) through (D)(4) shall not be required if an arc flash label is~~

(1) An arc-flash label applied in accordance with acceptable industry practice.

(2) Date the calculation was performed

Informational Note No. 1: 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. 2: Battery equipment suppliers can provide information about short-circuit current on any particular battery model.

Statement of Problem and Substantiation for Public Input

Section 706.10 is being revised to remove the clearing time from the marking requirement. Installers/Maintainers can be confused on the clearing time depending on the equipment is designed. In some cases the main disconnecting means can be a panelboard with six main disconnects. If this is the case then the installer will be confused on which clearing time to place on the equipment. Or, does the installer place six clearing times. It would be more practical to require the installer to simply put an arc flash label on the equipment with either the incident energy value or an PPE category to complete the process and take the ambiguity out of the equation.

The correct wording for the section is provided below. Terraview did not properly complele the strike-throughs in an easy-to-read manner.

(D) Notification. The disconnecting means shall be legibly marked in the field. The marking shall meet the requirements of 110.21(B) and shall include the following:

(1) Nominal ESS voltage
(2) Maximum available short-circuit current derived from the ESS
(3) An arc-flash label applied in accordance with acceptable industry practice.
(4) Date the calculation was performed

Informational Note No. 1: 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. 2: Battery equipment suppliers can provide information about short-circuit current on any particular battery model.

Submitter Information Verification

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Public Input No. 4063-NFPA 70-2017 [Section No. 706.7(D)]

(D) Notification.

The disconnecting means shall be legibly marked in the field. The marking shall meet the requirements of 110.21(B) and shall include the following:

(1) Nominal ESS voltage

(2) Maximum available short-circuit current derived from the ESS

(3) The associated clearing time or arc duration based on the available short-circuit current from the ESS and associated overcurrent protective devices if applicable

(4) Date the calculation was performed

Exception: The labeling in 706.7(D)(1) through (D)(4) shall not be required if an arc flash label is ~~applied~~ prepared in accordance with ~~acceptable industry practice~~ NFPA 70E .

Informational Note No. 1: 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. 2: Battery equipment suppliers can provide information about short-circuit current on any particular battery model.

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. 4068-NFPA 70-2017 [Section No. 110.16(B)]	

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Public Input No. 2874-NFPA 70-2017 [Section No. 706.7(E)]

(E) Partitions ~~and Distance~~ Between Components .

Where circuits from the input or output terminals of energy storage ~~system input and output terminals are more than 1.5 m (5 ft) from connected equipment, or where the circuits from these terminals~~ components in an energy storage system pass through a wall ~~or partition, the installation shall comply with the following:~~ , floor, or ceiling A disconnecting means shall be provided at the energy storage system end of the circuit. Fused disconnecting means or circuit breakers shall be permitted to be used.

A ~~second~~ readily accessible disconnecting means ~~located at the connected equipment shall be installed where the disconnecting means required by 706.7(E)(1) is not within sight of the connected equipment.~~

~~Informational Note No. 1: For remote disconnect controls in information technology equipment rooms, see 645.10 .~~

~~Informational Note No. 2: For overcurrent protection of batteries, see 240.21(H) .~~

- ~~Where fused disconnecting means are used, the line terminals of the disconnecting means shall be connected toward the energy storage system terminals.~~
- ~~Disconnecting means shall be permitted to be installed in energy storage system enclosures where explosive atmospheres can exist if listed for hazardous locations.~~
- ~~Where the disconnecting means in (1) is not within sight of the disconnecting means in (2), placards or directories shall be installed at the locations of all disconnecting means indicating the location of all other disconnecting means.~~

shall be provided within sight of the energy storage component.

Statement of Problem and Substantiation for Public Input

The original 706.7(E) language conflicts with other sections in Article 706 and is not required to install safe energy storage systems. ES system disconnection requirements are addressed in 706.7(A) & (B) and already require a marked disconnect within sight of the ESS. The output circuit from an ESS should be allowed to pass through a wall or be routed as appropriate without any additional requirements not otherwise addressed elsewhere in the Code. Where connecting ESS to other equipment other sections apply to ensure a local disconnect is added where required [705.12(A), 705.12(B)(1), 705.20, 705.21, 705.22, 705.23, 705.70, 712.34].

Section 706.7 should also only address disconnection requirements. Overcurrent requirements are in 706.21 including fuses with multiple supplies [706.21(E)] and location [706.21(F)]. When constructing large ESS, equipment may be located in different areas. In other than self-contained ES systems, storage components (i.e. battery) may be installed in rooms or buildings that are separate from other equipment in the ESS. We propose this new language to address this situation and ensure that a local disconnect is installed within sight for the storage component. The term partition should not be used to avoid confusion with enclosures or cases that will commonly hold storage components.

Submitter Information Verification

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Submittal Date: Mon Aug 28 15:19:36 EDT 2017

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Public Input No. 3830-NFPA 70-2017 [Section No. 706.7(E)]

(E) Partitions and Distance.

Where energy storage system input and output terminals are more than 1.5 m (5 ft) from connected equipment, or where the circuits from these terminals pass through a wall or partition, the installation shall comply with the following:

(1)

(2) A

~~disconnecting means shall be provided at the energy storage system end of the circuit. Fused disconnecting means or circuit breakers shall be permitted to be used.~~

(3) ~~A~~ second disconnecting means located at the connected equipment shall be installed where the disconnecting means required by 706.7(~~E)(1)~~ ~~is~~ A) is not within sight of the connected equipment.

Informational Note No. 1: For remote disconnect controls in information technology equipment rooms, see 645.10.

Informational Note No. 2: For overcurrent protection of batteries, see 240.21(H).

(4)

(5)

(6) Where

~~fused disconnecting means are used,~~

(7) the

~~line terminals of the~~

(8) disconnecting means

~~shall be connected toward the energy storage system terminals.~~

(9) ~~Disconnecting means shall be permitted to be installed in energy storage system enclosures where explosive atmospheres can exist if listed for hazardous locations.~~

(10) ~~Where the disconnecting means in (1) is~~ in 706.7(A) is not within sight of the disconnecting means in (2), placards or directories shall be installed at the locations of all disconnecting means indicating the location of all other disconnecting means.

Statement of Problem and Substantiation for Public Input

(E)(1) is duplicating (A) as it is not clear where a disconnect in addition to (A) and (E)(2) would be located other than as called out in (A).
(E)(3) and (4) should be moved to (A) as they should apply to any disconnecting means.
Changed (E)(5) to point to (A)

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3832-NFPA 70-2017 [Section No. 706.7(A)]	Go together

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Public Input No. 2758-NFPA 70-2017 [Section No. 706.8]

706.8 Connection to Other ~~Energy~~ Sources.

~~Connection~~ The connection of an ESS to other ~~energy~~ sources shall comply with the ~~requirements of 705~~ following . ~~12.~~

(A) Load Disconnect.

A load disconnect that has multiple sources of power shall disconnect all energy sources when in the off position.

(B) Identified Interactive Equipment.

~~Only inverters and ac modules~~ Energy storage systems that operate in parallel with other ac sources shall include inverters that are listed and identified as interactive ~~shall be permitted on interactive systems~~ .

(C) Loss of Interactive System Power.

Upon loss of primary source, an ESS with a utility interactive inverter shall comply with the requirements of 705.40.

(D) Unbalanced Interconnections.

Unbalanced connections between an energy storage system and electric power production sources shall be in accordance with 705.100.

(E) ~~Point of Connection~~ Connection to Other Energy Sources .

The ~~point~~ connection of ~~connection between~~ an energy storage system ~~and electric power production~~ to other energy sources shall be in accordance with 705.12. Where the energy storage system is part of a DC microgrid it shall comply with 712 Part 6.

(F) Stand-alone Operation

Where the output of an ESS is capable of operating in stand-alone mode the requirements of 710.15 shall apply.

Statement of Problem and Substantiation for Public Input

The proposal to change the title of this Section from “Connection to Other Energy Sources” to “Connection to Other Sources” is to clarify that requirements in this Section apply to connections to both energy sources and other sources. For example, an ESS output can provide energy to a stand-alone system, and stand-alone systems are defined in 710 as sources.

The requirements for connection to other energy sources and systems are revised as following:

The inadvertent reference to ac modules is replaced with energy storage systems to further clarify that this section, as covered in 706.8 is the energy storage system itself and not simply an inverter or ac module. The text has also been enhanced to clarify that when the ESS is utilized in an interactive application the inverter must be listed as interactive so it can safely operate in parallel with other ac sources.

An energy storage system may also be connected to a DC microgrid system, so the proposed change in subdivision (E) is intended to ensure that users of the NEC are aware that a connection between an ESS and a microgrid must comply with section 712 part 6.

The proposed addition of subdivision (F) ensures that if an ESS is capable of operating in stand-alone mode and providing energy to a stand-alone system, that the requirements in 710.15 (general requirements for stand-alone systems) are recognized. 710.15(A) is particularly important as it includes the requirements for the minimum capacity of the supply to the stand-alone system, which is a requirement for the sizing of the ESS if it is the sole source of supply.

This PI was developed by the PV Industry Forum (PVIF). For a description of the PVIF, please see PI-2751

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Public Input No. 4171-NFPA 70-2017 [Section No. 706.8]

706.8 Connection to Other Energy Sources.

Connection to other energy sources shall comply ~~with the requirements of 705.12~~ . withthe following:

(A) Load Disconnect.

A load disconnect ~~that has multiple sources of power shall disconnect all energy sources when in the off position.~~ shall comply with 705.21

(B) Identified Interactive Equipment.

Only inverters ~~and ac modules~~ listed and identified as interactive shall be permitted on interactive systems.

(C) Loss of Interactive System Power.

Upon loss of primary source, an ESS with a ~~utility~~ interactive inverter shall comply with the requirements of 705.40.

(D) Unbalanced Interconnections.

Unbalanced connections between an energy storage system and electric power production sources shall be in accordance with 705.100.

(E) Point of Connection.

The point of connection between an energy storage system and electric power production sources shall be in accordance with 705.12.

Statement of Problem and Substantiation for Public Input

Cleaned up the wording to make it more clear.
Changed (A) to refer to article in 705.21 instead of repeating that information
Deleted reference to AC Modules in (B). Probably here due to a cut and paste error.
Deleted “utility” from (C) to harmonize with 690 and the removal of utility from interactive inverter.
Text in header was duplicated in (E) so the text in the header refering to 705.12 was deleted.

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Public Input No. 4271-NFPA 70-2017 [Section No. 706.8(D)]

(D) Unbalanced Interconnections.

Unbalanced connections between an energy storage system with an ac output and other ac electric power production sources shall be in accordance with 705.100.

Statement of Problem and Substantiation for Public Input

The output of an ESS may be ac or dc. The requirements in this section addressing unbalanced connections only apply to those ESS systems that output ac power.

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Public Input No. 4274-NFPA 70-2017 [Section No. 706.8(E)]

(E) Point of Connection.

The point of connection between an energy storage system and electric power production sources shall be in accordance with 705.~~12~~ 12 and Parts III and VI of Article 712 .

Statement of Problem and Substantiation for Public Input

The output of an ESS may be ac or dc. A reference to article 712 will provide appropriate guidance as to how to connect an ESS with a dc output to other sources.

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Public Input No. 2961-NFPA 70-2017 [Section No. 706.10]

Part III. Installation Requirements.

706.10 Energy Storage System Locations.

Battery locations shall conform to 706.10(A), (B), and (C).

(A) Ventilation.

Provisions appropriate to the energy storage technology shall be made for sufficient diffusion and ventilation of any possible gases from the storage device, if present, to prevent the accumulation of an explosive mixture. A pre-engineered or self-contained ESS shall be permitted to provide ventilation in accordance with the manufacturer's recommendations and listing for the system.

Informational Note No. 1: See NFPA 1-2015, *Fire Code*, Chapter 52, for ventilation considerations for specific battery chemistries.

Informational Note No. 2: Some storage technologies do not require ventilation.

Informational Note No. 3: A source for design of ventilation of battery systems is IEEE 1635-2012/ASHRAE Guideline 21-2012 *Guide for the Ventilation and Thermal Management of Batteries for Stationary Applications*, and the UBC.

Informational Note No. 4: Fire protection considerations are addressed in NFPA 1-2015, *Fire Code*.

(B) ~~Guarding of Live Parts.~~

~~Guarding of live parts shall comply with 110.27 .~~

Dwelling Units.

An ESS for dwelling units shall not exceed 100 volts between conductors or to ground.

Exception: Where live parts are not accessible during routine ESS maintenance, an ESS voltage exceeding 100 volts shall be permitted.

(C) Spaces About ESS Components.

Requirements for spaces around batteries that are components of certain Energy Storage Systems are provided in 480.10(C). Spaces about the ESS shall comply with 110.26. ~~Working space shall be measured from the edge of the ESS modules, battery cabinets, racks, or trays. For battery racks, there shall be a minimum clearance of 25 mm (1 in.) between a cell container and any wall or structure on the side not requiring access for maintenance. ESS modules, battery cabinets, racks, or trays shall be permitted to contact adjacent walls or structures, provided that the battery shelf has a free air space for not less than 90 percent of its length.~~

(D) Pre-engineered and self-contained ESS.

Pre-engineered and self-contained ESSs shall be permitted to have working space between components within the system in accordance with the manufacturer's recommendations and listing of the system.

Informational Note: Additional space is often needed to accommodate ESS equipment hoisting equipment, tray removal, or spill containment.

~~**(D)** Egress.~~

~~A personnel door(s) intended for entrance to and egress from rooms designated as ESS rooms shall open in the direction of egress and shall be equipped with listed panic hardware.~~

~~**(E)** Illumination.~~

~~Illumination shall be provided for working spaces associated with ESS and their equipment and components. Luminaires shall not be controlled by automatic means only. Additional luminaires shall not be required where the work space is illuminated by an adjacent light source. The location of luminaires shall not do either of the following:~~

(1) ~~Expose personnel to energized system components while performing maintenance on the luminaires in the system space~~

(2) ~~Create a hazard to the system or system components upon failure of the luminaire~~

Statement of Problem and Substantiation for Public Input

This public input is the result of an Energy Storage Task Group that was put together by CMP 13 to correlate Article 706, Energy Storage Systems and Article 480, Batteries. Various sections between the two articles were redundant while certain sections in Article 706 strictly pertained to batteries and were better suited in the Battery article. It was also the charge of the task group to better define Energy Storage Systems. The Task Group members were Larry Ayer, Jim Dollard, Dan Neeser, Mario Spina, Tim Croushore, Bill Cantor, Chad Kennedy, Steve Froemming, John Kovacik and Dan Caron.

This specific public input is editorial and seeks to improve usability for the installation requirements for an Energy Storage System.

1. "Part III. Installation requirements" has been added to better group the requirements found in 706.10 and beyond.

2. The voltage level demarcation of 100 volts for dwelling unit energy storage systems has been relocated from 706.30(A) to 706.10(B).

3. 706.10(B), Spaces about ESS Components has been renumbered to (C) and now refers the user of the code to either look in 110.26 or if the system consists of batteries to look at 480.10(C).

4. Guarding of Live Parts in 706.10(B) was deleted since this requirement is already found in 110.27.

5. The sections on Egress and Illumination have been deleted since these are components of battery installations and are already covered in 480.10(E) and (G).

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2989-NFPA 70-2017 [Sections Part III., 706.30, 706.31, 706.32, 706.33, 706.34]	Deletes section 706.30(A)

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Public Input No. 3271-NFPA 70-2017 [Section No. 706.10 [Excluding any Sub-Sections]]

Battery locations shall conform to 706.10(A) ~~,~~ through (~~B~~ E) ~~, and (C)~~ .

Statement of Problem and Substantiation for Public Input

This section contains a list that goes from A through E, are D and E supposed to be optional?

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Public Input No. 3269-NFPA 70-2017 [Section No. 706.10(C)]

(C) Spaces About ESS Components.

Spaces about the ESS shall comply with 110.26. Working space shall be measured from the edge of the ESS modules, battery cabinets, racks, or trays. For battery racks, there shall be a minimum clearance of 25 mm (1 in.) between a cell container and any wall or structure on the side not requiring access for maintenance. ESS modules, battery cabinets, racks, or trays shall be permitted to contact adjacent walls or structures, provided that the battery shelf has a free air space for not less than 90 percent of its length. Pre-engineered and self-contained ESSs shall be permitted to have working space between components within the system in accordance with the manufacturer's recommendations and listing of the system.

~~Informational Note: Additional space is often needed to accommodate ESS equipment hoisting equipment, tray removal, or spill containment.~~

Statement of Problem and Substantiation for Public Input

The IN does not comply with the NEC Style Manual. It provides information that will be covered in the manufacturer's installation documents and the information is not related to the requirements of the associated NEC section.

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Public Input No. 3272-NFPA 70-2017 [Section No. 706.10(D)]

(D) Entrance to and Egress from Working Space .

A personnel door(s) ~~intended~~ intended for entrance to and egress from ~~rooms designated as ESS rooms~~ the designated ESS working space less than 7.6 m (25 ft) from the nearest edge of the designated ESS working space, the door(s) shall open in the direction of egress and ~~shall~~ be ~~equipped~~ equipped with listed panic hardware.

Statement of Problem and Substantiation for Public Input

The proposal modifies the language so that is matches 110.26(C)(3) and does not make the requirements more restrictive. If the designated ESS working space in inside an electrical space that is compliant with 110.26(C)(3) it might not be compliant with the 2017 NEC 706.10(D), resulting in unnecessary modifications to the building.

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Public Input No. 3550-NFPA 70-2017 [Section No. 706.10(E)]

(E) Illumination.

Illumination shall be provided for working spaces associated with ESS and their equipment and components. Luminaires shall not be controlled by automatic means only. Additional luminaires shall not be required where the work space is illuminated by an adjacent light source. ~~The location of luminaires shall not do either of the following:~~

(1) ~~Expose personnel to energized system components while performing maintenance on the luminaires in the system space~~

(2) ~~Create a hazard to the system or system components upon failure of the luminaire~~

Statement of Problem and Substantiation for Public Input

Item (1) and (2) are covered by NEC section 410 and is duplicative here. It should be deleted.

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Public Input No. 3702-NFPA 70-2017 [Section No. 706.11]

706.~~11~~ ~~Directory~~ 11 Identification of Power Sources .

ESS shall be indicated by 706.11(A) and (B). ~~The markings or labels shall be in accordance with 110.21(B) .~~

(A) ~~Directory~~ Facilities with Utility Services and ESS .

~~A permanent plaque or directory denoting all electric power sources on or in the premises shall be installed at each service equipment location and at locations of all electric power production sources capable of being interconnected.~~

~~Exception: Installations with large numbers of power production sources shall be permitted to be designated by groups~~

Plaques or directories shall be installed in accordance with 705.10 and 712.10(A) .

(B) Facilities with Stand-Alone Systems.

~~Any structure or building with an ESS that is not connected to a utility service source and is a stand-alone system shall have a permanent plaque or directory installed on the exterior of the building or structure at a readily visible location acceptable to the authority having jurisdiction. The plaque or directory shall indicate the location of system disconnecting means and that the structure contains a stand-alone electrical power system~~ Plaques or directories shall be installed in accordance with 710.10 .

Statement of Problem and Substantiation for Public Input

This public input addresses ongoing concerns expressed by the fire service and other first responders on the need to secure on-site power sources during emergencies and awareness of where those sources are. Effective means of securing utility sources have long been established by local fire departments however there is a lack of uniform procedures in how to effectively secure on-site power sources that may be at a premises due to the variety of different source types, the rapid rate of product adoption, and varied or absent Code language addressing notice on the location of specific sources. This proposed change is part of a grouping of proposals that will correlate various sections of the NEC and consistently require this important marking be located outside a building regardless of whether the utility service equipment is located indoors or outdoors. This will provide warnings to first responders about the presence and location of on-site power sources prior to entering a building.

Since ESS may be connected to interactive systems, stand-alone systems, or both, and may be have either AC or DC outputs, this new proposed language directs users to other articles that are appropriate for the specific application. By removing specific requirements and simply pointing to appropriate other articles and sections, this change will also remove the chance of deviations that could otherwise develop in marking requirements between different sources. The requirements in 110.21(B) apply to all field-applied hazard markings such as these so it is not necessary to explicitly repeat that here.

This input has been developed and is supported by Tesla, who manufactures and installs both PV and energy storage equipment as well as Robert J. Davidson of Davidson Code Concepts. LLC. Complementary language is also being submitted by this team to fire and building Codes as appropriate in an attempt to harmonize these requirements across all relevant Codes.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3561-NFPA 70-2017 [Section No. 705.10]	Related text for interconnected ac source applications
Public Input No. 3599-NFPA 70-2017 [New Section after 710.6]	Related text for stand-alone system applications
Public Input No. 3601-NFPA 70-2017 [Section No. 712.10]	Related text for dc microgrid system applications
Public Input No. 3713-NFPA 70-2017 [Section No. 690.56(A)]	Addresses on-site PV sources in Stand-alone systems

Public Input No. 3717-NFPA 70-2017 [Section No. 690.56(B)]	Addresses on-site PV sources in utility interactive systems
Public Input No. 3724-NFPA 70-2017 [Section No. 690.56(C)(1)]	Addresses PV rapid shutdown placarding requirements
Public Input No. 3729-NFPA 70-2017 [New Section after 480.7(D)]	Addresses on-site battery sources
Public Input No. 3731-NFPA 70-2017 [Section No. 445.11]	Addresses on-site generator sources
Public Input No. 3735-NFPA 70-2017 [Section No. 694.22(C)(2)]	Addresses marking of on-site wind generator disconnects with placards.
Public Input No. 3736-NFPA 70-2017 [Section No. 694.54]	Addresses on-site wind generator sources
Public Input No. 3746-NFPA 70-2017 [Section No. 692.4(B)]	Addresses on-site fuel cell sources

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Public Input No. 3557-NFPA 70-2017 [Section No. 706.11(B)]

(B) Facilities with Stand-Alone Systems.

Any structure or building with an ESS that ~~is not connected to a utility service source and is a~~ can operate as a stand-alone system shall have a permanent plaque or directory installed on the exterior of the building or structure at a readily visible location acceptable to the authority having jurisdiction. The plaque or directory shall indicate the location of system disconnecting means and that the structure contains a stand-alone electrical power system.

Statement of Problem and Substantiation for Public Input

Any ESS that provides back up functionality can operate in a stand-alone mode as well as be connected to a utility source when available. The way it was written back up systems might be considered exempt so the CMP should decide if the marking requirement should apply to back-up capable systems.

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Public Input No. 385-NFPA 70-2017 [Section No. 706.11(B)]

(B) Facilities with Stand-Alone Systems.

Any structure or building with an ESS that is not connected to a utility service source and is a stand-alone system shall have a permanent plaque or directory installed on the exterior of the building or structure at a readily visible ~~location acceptable to the~~ location approved by the authority having jurisdiction. The plaque or directory shall indicate the location of system disconnecting means and that the structure contains a stand-alone electrical power system.

Statement of Problem and Substantiation for Public Input

This change is not a technical change. It is intended to be editorial only. This revision is merely an attempt to provide consistent terminology throughout the code. I believe the better word to use in this instance is the term "approved" since it is defined in Article 100 and used throughout the code and generally understood by installers and inspectors alike.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 383-NFPA 70-2017 [Section No. 240.86 [Excluding any Sub-Sections]]	use of term "approved" versus "acceptable"
Public Input No. 382-NFPA 70-2017 [Section No. 685.1]	use of term "approved" versus "acceptable"
Public Input No. 381-NFPA 70-2017 [Section No. 503.155(A)]	use of term "approved" versus "acceptable"
Public Input No. 380-NFPA 70-2017 [Section No. 708.6(B)]	use of term "approved" versus "acceptable"
Public Input No. 379-NFPA 70-2017 [Section No. 701.12(B)(3)]	use of term "approved" versus "acceptable"
Public Input No. 378-NFPA 70-2017 [Section No. 700.3(B)]	use of term "approved" versus "acceptable"
Public Input No. 377-NFPA 70-2017 [Section No. 701.12(B)(1)]	use of term "approved" versus "acceptable"
Public Input No. 376-NFPA 70-2017 [Section No. 701.3(B)]	use of term "approved" versus "acceptable"
Public Input No. 375-NFPA 70-2017 [Section No. 700.12(B)(3)]	use of term "approved" versus "acceptable"
Public Input No. 374-NFPA 70-2017 [Section No. 700.12(B)(1)]	use of term "approved" versus "acceptable"
Public Input No. 373-NFPA 70-2017 [Section No. 820.44(D)]	use of term "approved" versus "acceptable"

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Public Input No. 3578-NFPA 70-2017 [Section No. 706.20]

706.20 Circuit Sizing and Current.

(A) Maximum Rated Current for a Specific Circuit.

The maximum current for the specific circuit shall be calculated in accordance with 706.20(A)(1) through (A)(~~5~~ 6).

(1) Nameplate-Rated Circuit Current.

The nameplate(s)-rated circuit current shall be the rated current indicated on the ESS nameplate(s) or system listing for pre-engineered or self-contained systems of matched components intended for field assembly as a system.

(2) Inverter Output Circuit Current.

The maximum current shall be the inverter continuous output current rating.

(3) Inverter Input Circuit Current.

The maximum current shall be the continuous inverter input current rating when the inverter is producing rated power at the lowest input voltage.

(4) Inverter Utilization Output Circuit Current.

The maximum current shall be the continuous inverter output current rating when the inverter is producing rated power at the lowest input voltage.

(5) DC to DC Converter Output Current.

The maximum current shall be the dc-to-dc converter continuous output current rating.

(6) Maximum Continuous Rated Current

The maximum rated current the ESS can delivere for 3 or more hours.

(B) Conductor Ampacity and Overcurrent Device Ratings.

The ampacity of the feeder circuit conductors from the ESS(s) to the wiring system serving the loads to be serviced by the system shall not be less than the greater of the (1) nameplate(s) rated circuit current as determined in accordance with 706.20(A) or (2) the rating of the ESS(s) overcurrent protective device(s).

(C) Ampacity of Grounded or Neutral Conductor.

If the output of a single-phase, 2-wire ESS output(s) is connected to the grounded or neutral conductor and a single ungrounded conductor of a 3-wire system or of a 3-phase, 4-wire, wye-connected system, the maximum unbalanced neutral load current plus the ESS(s) output rating shall not exceed the ampacity of the grounded or neutral conductor.

Statement of Problem and Substantiation for Public Input

Added Maximum Continous Rated Current. Most available ESS do not provide the rated current for 3 or more hours but sum can provide a reduced current. This will impact the selection of overcurrent protection since it is unreasonable to size all overcurrent protection based on a continuous current rating at 125% of the maximum rated current.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3572-NFPA 70-2017 [Section No. 706.21]	Go together

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Public Input No. 2766-NFPA 70-2017 [Section No. 706.20(A)(1)]

(1) ~~Nameplate~~ Nameplate -Rated Circuit Current.

~~The nameplate(s)-rated~~

For self-contained or pre-engineered systems of matched components intended for field assembly as a system, the maximum circuit current shall be the rated current indicated on the ESS nameplate(s) or system listing

~~for pre-engineered or self-contained systems of matched components intended for field assembly as a system~~

. Where the ESS has separate input (charge) and output (discharge) circuits or ratings, these shall be considered individually .

Statement of Problem and Substantiation for Public Input

The proposed revision is intended to enhance the sentence structure and provide for increased clarity. The word “maximum” has been applied to ensure the focus of this criterion, maximum design current level, is recognized. In addition the revisions are intended to better align the NEC with UL 9540, which is referenced in the NEC. In addition it is necessary to clarify the text in that an ESS may have two nameplates, each respectively indicating input or output circuit rating, or one nameplate showing input and output circuit ratings.

This PI was developed by the PV Industry Forum (PVIF). For a description of the PVIF, please see PI-2751

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Submittal Date: Fri Aug 25 18:45:00 EDT 2017

Public Input No. 3836-NFPA 70-2017 [Section No. 706.20(A)(1)]

(1) Nameplate-Rated Circuit Current.

The nameplate(s)-rated circuit current shall be the rated current indicated on the ESS nameplate(s) or system listing for pre-engineered or self-contained systems of matched components intended for field assembly as a system. Where the same terminals on the ESS are used for charging and discharging and there is listed a charge and discharge rated current the greater of the two shall be used.

Statement of Problem and Substantiation for Public Input

An ESS may use the same terminals for both charging and discharging. The rated current accepted during charging may be different than the rated current provided during discharging and the design should use the greater of the two.

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Public Input No. 3842-NFPA 70-2017 [Section No. 706.20(A)(1)]

(1) Nameplate-Rated Circuit Current.

The nameplate(s)-rated circuit current shall be the rated current indicated on the ESS nameplate(s) or system listing for pre-engineered or self-contained systems ~~of matched components~~ intended for field assembly as a system.

Statement of Problem and Substantiation for Public Input

I know of no definition for "matched components" or other usage in the NEC but I assume this is intended to mean components that are intended to work together. Since I can't imagine a company putting together a pre-engineered system out of unmatched components, or how someone would determine if the components in a pre-engineered system were matched or not the text should be deleted as unenforceable.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3840-NFPA 70-2017 [Definition: Energy Storage System, Pre-Engineered of Matche...]	Go together
Public Input No. 3838-NFPA 70-2017 [Section No. 706.4]	Go together

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Public Input No. 3035-NFPA 70-2017 [Section No. 706.20(A)(4)]

(4) Inverter Utilization Output Circuit Current.

The maximum current shall be the continuous ~~inverter~~ ac output current rating of the inverter when the inverter is producing rated power ~~at the lowest input voltage~~ .

Statement of Problem and Substantiation for Public Input

The Inverter Utilization Output Current is an ac value of the output of an ESS. The output current of an ESS should be the same no matter the input dc voltage; hence the suggested change. Word order is revised to align with the title structure.

This PI was developed by the PV Industry Forum (PVIF). For a description of the PVIF, please see PI-2751

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Public Input No. 3560-NFPA 70-2017 [Section No. 706.20(A)(4)]

~~**(4)** Inverter Utilization Output Circuit Current.~~

~~The maximum current shall be the continuous inverter output current rating when the inverter is producing rated power at the lowest input voltage.~~

Statement of Problem and Substantiation for Public Input

The Inverter Utilization Output Circuit Current is always going to be the same as the Inverter Output Circuit Current. The inverter output current at rated power, and rated output voltage, is not dependent on the input voltage. It is definitely not going to be greater. I=P/E

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Public Input No. 2768-NFPA 70-2017 [Section No. 706.20(B)]

(B) Conductor Ampacity ~~and Overcurrent Device Ratings~~ .

The ampacity of the feeder circuit conductors from the ESS(s) to the wiring system serving the loads to be serviced by the system shall not be less than the greater of the (1) nameplate(s) rated circuit current as determined in accordance with 706.20(A) or (2) the rating of the ESS(s) overcurrent protective device(s).

Statement of Problem and Substantiation for Public Input

The provisions in 706.20(B) states requirements for ampacity of the feeder circuit conductors, while overcurrent protection requirements are addressed separately in 706.21. The mention of overcurrent device ratings in the title of this Section subdivision suggests that the requirements stated address that issue, when they do not. Therefore this proposal is to delete that misleading part of the title to clarify what this subdivision covers.

This PI was developed by the PV Industry Forum (PVIF). For a description of the PVIF, please see PI-2751

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Submittal Date: Fri Aug 25 18:48:12 EDT 2017

Public Input No. 2871-NFPA 70-2017 [Section No. 706.20(B)]

(B) Conductor Ampacity ~~and Overcurrent Device Ratings.~~

The ampacity of the feeder circuit conductors from the ESS(s) to the wiring system serving the loads to be serviced by the system shall not be less than the greater of the (1) nameplate(s) rated circuit current as determined in accordance with 706.20(A) or (2) the rating of the ESS(s) overcurrent protective device(s).

Statement of Problem and Substantiation for Public Input

The title of this section should be revised since the requirements specified apply to conductor ampacity. The requirements for overcurrent protective devices are covered in existing Section 706.21.

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Submittal Date: Mon Aug 28 15:11:43 EDT 2017

Public Input No. 2988-NFPA 70-2017 [Section No. 706.21]

706.21 Overcurrent and Ground-Fault Protection.

(A) Circuits and Equipment.

ESS circuit conductors shall be protected in accordance with the requirements of Article 240. Protection devices for ESS circuits shall be in accordance with the requirements of 706.21(B) through (F). Circuits shall be protected at the source from overcurrent.

(B) Overcurrent Device Ampere Ratings.

Overcurrent protective devices, where required, shall be rated in accordance with Article 240 and the rating provided on systems serving the ESS and shall be not less than 125 percent of the maximum currents calculated in 706.20(A).

(C) Direct Current Rating.

Overcurrent protective devices, either fuses or circuit breakers, used in any dc portion of an ESS shall be listed and for dc and shall have the appropriate voltage, current, and interrupting ratings for the application.

(D) Current Limiting.

A listed and labeled current-limiting overcurrent protective device shall be installed adjacent to the ESS for each dc output circuit.

Exception: Where current-limiting overcurrent protection is provided for the dc output circuits of a listed ESS, additional current-limiting overcurrent devices shall not be required.

(E) Fuses.

Means shall be provided to disconnect any fuses associated with ESS equipment and components when the fuse is energized from both directions and is accessible to other than qualified persons. Switches, pullouts, or similar devices that are rated for the application shall be permitted to serve as a means to disconnect fuses from all sources of supply.

(F) Location.

Where ESS input and output terminals are more than 1.5 m (5 ft) from connected equipment, or where the circuits from these terminals pass through a wall or partition, overcurrent protection shall be provided at the ESS.

(G) Ground-Fault Detection.

On ESS exceeding 100 volts between the conductors or to ground, the battery circuits shall be permitted to operate with ungrounded conductors, provided a ground-fault detector and indicator is installed to monitor for ground faults within the storage system.

Statement of Problem and Substantiation for Public Input

This public input is the result of an Energy Storage Task Group that was put together by CMP 13 to correlate Article 706, Energy Storage Systems and Article 480, Batteries. Various sections between the two articles were redundant while certain sections in Article 706 strictly pertained to batteries and were better suited in the Battery article. It was also the charge of the task group to better define Energy Storage Systems. The Task Group members were Larry Ayer, Jim Dollard, Dan Neeser, Mario Spina, Tim Croushore, Bill Cantor, Chad Kennedy, Steve Froemming, John Kovacik and Dan Caron.

1. This specific public input relocates the ground fault requirement from section 706.30(D) into the overcurrent protection requirement section.
2. Section 706.21 is re-titled "Overcurrent and Ground-fault Protection to capture the addition of 706.21(G).

Related Public Inputs for This Document

Related Input	Relationship

Public Input No. 2989-NFPA 70-2017 [Sections Part III., 706.30, 706.31, 706.32, 706.33, 706.34]	Deletes 706.30(D)

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Submittal Date: Wed Aug 30 10:20:38 EDT 2017

Public Input No. 3037-NFPA 70-2017 [Section No. 706.21]

706.21 Overcurrent Protection.

(A) Circuits and Equipment.

ESS circuit conductors shall be protected in accordance with the requirements of Article 240. Protection devices for ESS circuits shall be in accordance with the requirements of 706.21(B) through (F). Circuits shall be protected at the source from overcurrent.

(B) Overcurrent Device Ampere Ratings.

Overcurrent protective devices, where required, shall be rated in accordance with Article 240 and the rating provided on systems serving the ESS and shall be not less than 125 percent of the maximum currents calculated in 706.20(A).

(C) Direct Current Rating.

Overcurrent protective devices, either fuses or circuit breakers, used in any dc portion of an ESS shall be listed and for dc and shall have the appropriate voltage, current, and interrupting ratings for the application.

(D) Current Limiting.

A listed and labeled current-limiting overcurrent protective device shall be installed adjacent to the ESS for each dc output circuit.

Exception: Where current-limiting overcurrent protection is provided for the dc output circuits of a listed ESS, additional current-limiting overcurrent devices shall not be required.

(E) Fuses.

Means shall be provided to disconnect any fuses associated with ESS equipment and components when the fuse is energized from both directions and is accessible to other than qualified persons. Switches, pullouts, or similar devices that are rated for the application shall be permitted to serve as a means to disconnect fuses from all sources of supply.

(F) Location.

Where ESS input and output terminals are more than 1.5 m (5 ft) from connected equipment, or where the circuits from these terminals pass through a wall or partition, overcurrent protection shall be provided at the ESS.

<u>(G) Bidirectional Current Flow.</u>

<u>In circuits that may be subject to bidirectional current flow (flow in either direction) under normal operation or under fault conditions, overcurrent protection devices, including any related accessories for those overcurrent protection devices, shall be approved for backfeeding or bidirectional operation.</u>

Statement of Problem and Substantiation for Public Input

Many ESS charge and discharge using the same circuit conductors - thus during normal operation, operating currents and fault currents may flow through the overcurrent protection device in either direction. OCPDs and any related accessories in bidirectional ESS circuits must be suitably evaluated for proper overload and fault protection for current flowing in either direction.

This added language requires that devices must be approved per the NEC definition - meaning acceptable to the AHJ, possibly based on factory certification. This language allows AHJs leeway to decide which OCPD are suitable for this purpose and also brings attention to this important safety issue.

This PI was developed by the PV Industry Forum (PVIF). For a description of the PVIF, please see PI-2751

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Copyright Assignment

Public Input No. 3572-NFPA 70-2017 [Section No. 706.21]

706.21 Overcurrent Protection.

~~**(A)** Circuits and Equipment.~~

~~ESS circuit conductors shall be protected in accordance with the requirements of Article 240.~~

Protection devices for ESS circuits shall be in accordance with the requirements

~~of~~

of 706.21(

~~B~~

A)

~~through~~

through (F).

(A) Circuits and Equipment.

Circuits shall be protected at the source from overcurrent.

(B) Overcurrent Device Ampere Ratings.

Overcurrent

~~protective~~

protective devices, where required, shall be rated in accordance with

~~Article 240 and the rating provided on systems serving the ESS and shall be not less than 125 percent of the maximum currents calculated in 706.20(A) .~~

~~**(C)** Direct Current Rating.~~

~~Overcurrent protective devices, either fuses or circuit breakers, used in any dc portion of an ESS shall be listed and for dc and shall have the appropriate voltage, current, and interrupting ratings for the application.~~

~~(D~~

706.21(B)(1) or (2)

(1) For ESS capable of supplying continious power for 3 hours or more

Where a Maximum Continuous Rated Current is available for the ESS the overcurrent protective devices, where required, shall be rated not less than the greater of 125 percent of the Maximum Continuous Rated Current or 100% of the maximum current calculated in 706.20 . Where a Maximum Continuous Rated Current is not available for the ESS the overcurrent protective devices, where required, shall be rated not less than 125 percent of the maximum current from 706.20 .

(2) For ESS only capable of supplying power for less than 3 hours

The overcurrent protective devices, where required, shall be rated not less than 100 percent of the maximum current from 706.20 .

(C) Current Limiting.

A listed and labeled current-limiting overcurrent protective device shall be installed adjacent to the ESS for each dc output circuit.

Exception: Where current-limiting overcurrent protection is provided for the dc output circuits of a listed ESS, additional current-limiting overcurrent devices shall not be required.

(~~E~~ D) Fuses.

Means shall be provided to disconnect any fuses associated with ESS equipment and components when the fuse is energized from both directions and is accessible to other than qualified persons. Switches, pullouts, or similar devices that are rated for the application shall be permitted to serve as a means to disconnect fuses from all sources of supply.

(~~F~~ E) Location.

Where ESS input and output terminals are more than 1.5 m (5 ft) from connected equipment, or where the circuits from these terminals pass through a wall or partition, overcurrent protection shall be provided at the ESS.

Statement of Problem and Substantiation for Public Input

Section 706.21 needed a little work:
Calling out references to NEC articles with no reference to a part does not comply with the NEC Style Manual.
Moved "Protection devices for ESS circuits shall be in accordance with the requirements of 706.21(B) through (F)" outside the list it is referencing.
Added wording to allow for non-continous current rating of OCPD. For ESS that do not have a 3 hour supply rating at the maximum rated current it is overly restrictive to require a 125% rated OCPD. In a different PI I added Maximum Continuous Rated Current to 706.20 to allow manufacturers to supply a current that the ESS can supply continuously for 3 or more hours. This will proved flexibility in system design, lower cost, and not reduce safety.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3578-NFPA 70-2017 [Section No. 706.20]	Go together

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Public Input No. 2769-NFPA 70-2017 [Section No. 706.21(A)]

(A) Circuits and Equipment.

~~ESS circuit conductors shall be protected in accordance with the requirements of Article 240~~ Overcurrent protection shall be provided for each ungrounded circuit conductor of an ESS . Protection devices for ESS circuits shall be in accordance with the requirements of 706.21(B) through (F). ~~Circuits shall be protected at the source from overcurrent.~~

Statement of Problem and Substantiation for Public Input

It is appropriate to provide overcurrent protection in the output circuit of any ESS to protect the circuits from overcurrent. However, since an ESS could either be dc or ac, and may or may not have power conditioning equipment included with the system, the Code should not be overly prescriptive about any overcurrent protective device, especially since many ESS will be listed and include manufacturer-provided required OCP. The second sentence referencing Article 240 is deleted per the requirements of the NEC Style Manual section 4.1.1 which does not allow for one section of the NEC to reference an entire Article. The method of OCP needs to meet whatever applicable requirements there are in Chapters 1 and 2 without specifically referencing them. Additionally, the details in 706.21 (B) - (F) address other specifics, including location. The phrase "at the source" is removed as overly restrictive and is also unnecessary since section (F) addresses the location of OCP under unique situations.

This PI was developed by the PV Industry Forum (PVIF). For a description of the PVIF, please see PI-2751

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Public Input No. 2771-NFPA 70-2017 [Section No. 706.21(B)]

(B) Overcurrent Device Ampere Ratings.

Overcurrent protective devices, where required, shall be rated in accordance with Article 240 and the rating provided on systems serving the ESS~~ and shall be not less than 125 percent of the maximum currents calculated in 706.20(A)~~ . . An assembly, together with its overcurrent device(s), that is listed for continuous operation at 100 percent of its rating shall be permitted to be used at 100 percent of its rating.

Statement of Problem and Substantiation for Public Input

The proposed change allows overcurrent devices that are rated at 100% to be used at their rated capacity. The current language that is proposed to be deleted can inadvertently cause a double derating of otherwise properly sized overcurrent protective devices, the requirements for which are provided by Chapters 1, 2 and 3 of this Code.

This PI was developed by the PV Industry Forum (PVIF). For a description of the PVIF, please see PI-2751

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Public Input No. 2772-NFPA 70-2017 [Section No. 706.21(C)]

(C) Direct Current Rating.

Overcurrent protective devices, either fuses or circuit breakers, used in any dc portion of an ESS shall be listed ~~and~~ for dc and shall have the appropriate voltage, current, and interrupting ratings for the application.

Statement of Problem and Substantiation for Public Input

The additional “and” is not needed and detracts from the clarity of the requirement.

This PI was developed by the PV Industry Forum (PVIF). For a description of the PVIF, please see PI-2751

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Public Input No. 2872-NFPA 70-2017 [Section No. 706.21(C)]

(C) Direct Current Rating.

Overcurrent protective devices, either fuses or circuit breakers, used in any dc portion of an ESS shall be listed ~~and~~ for dc and shall have the appropriate voltage, current, and interrupting ratings for the application.

Statement of Problem and Substantiation for Public Input

The proposed change is editorial and intended to improve readability of this section.

Submitter Information Verification

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Submittal Date: Mon Aug 28 15:14:14 EDT 2017

Public Input No. 2773-NFPA 70-2017 [Section No. 706.21(D)]

(D) Current Limiting.

A listed and labeled current-limiting overcurrent protective device shall be installed ~~adjacent to the ESS for~~ in each dc output circuit of an ESS where the available short-circuit current from the ESS exceeds the interrupting or withstand ratings of other equipment in that circuit .

Exception: Where current-limiting overcurrent protection is provided for the dc output circuits of a listed ESS, additional current-limiting overcurrent devices shall not be required.

Statement of Problem and Substantiation for Public Input

This proposal re-inserts text from the 2014 NEC that is necessary to complete this Section subdivision that appears to have been inadvertently left out when the new Article 706 was developed for 2017 NEC. Additional clarification is provided to indicate that the protective device would be required in each dc output circuit.

This PI was developed by the PV Industry Forum (PVIF). For a description of the PVIF, please see PI-2751

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Submittal Date: Fri Aug 25 18:56:24 EDT 2017

Public Input No. 3794-NFPA 70-2017 [Section No. 706.23(A)]

(A) General.

Provisions shall be provided to control the charging process of the ESS. All adjustable means for control of the charging process shall be accessible only to qualified persons.

~~Informational Note: Certain types of energy storage equipment such as valve-regulated lead acid or nickel cadmium can experience thermal failure when overcharged.~~

Statement of Problem and Substantiation for Public Input

The IN is accurate but only calls out a small segment battery chemistries. Many hazards exist in charging other types of battery chemistries, far too many to cover in an IN. The IN should be deleted.

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Public Input No. 2774-NFPA 70-2017 [Section No. 706.23(B)(3)]

(3) Energy Storage Systems Using ~~Utility-~~ Interactive Inverters.

Systems using ~~utility-~~ interactive inverters to control energy storage state-of-charge by diverting excess power into the ~~utility~~ area electric power system shall comply with 706.23(B)(3)(a) and (B)(3)(b).

(a) These systems shall not be required to comply with 706.23(B)(2).

(b) These systems shall have a second, independent means of controlling the ESS charging process for use when the utility is not present or when the primary charge controller fails or is disabled.

Statement of Problem and Substantiation for Public Input

Deleting the word “interactive”in the title and first sentence will harmonize this language with the 2017 NEC which nearly universally deleted the word “utility” to simplify and standardize the terminology as simply “interactive inverter.” Removing the reference to “utility” and adding “area electric power system” in the second sentence will clarify that the ESS may be connected to an ac microgrid as part of a stand-alone system, or to a utility. This fills a gap in the code wherein the scope of the provision, if applying only to utility interactive inverters, means those inverters that are associated with an ESS which is not interactive with a utility would appear to be not covered. This is likely to lead to either such situations being precluded from consideration or their being allowed but without these provisions of the code applying to them.

This PI was developed by the PV Industry Forum (PVIF). For a description of the PVIF, please see PI-2751

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Public Input No. 2873-NFPA 70-2017 [Section No. 706.23(B)(3)]

(3) Energy Storage Systems Using ~~Utility-~~ Interactive Inverters.

Systems using ~~utility-~~ interactive inverters to control energy storage state-of-charge by diverting excess power into the ~~utility~~ electric power system shall comply with 706.23(B)(3)(a) and (B)(3)(b).

(a) These systems shall not be required to comply with 706.23(B)(2).

(b) These systems shall have a second, independent means of controlling the ESS charging process for use when the utility is not present or when the primary charge controller fails or is disabled.

Statement of Problem and Substantiation for Public Input

The term “utility-interactive inverter” was replaced with “interactive inverter” in multiple locations within the NEC during the last few code cycles. This change aligns with the prior revisions and adds clarity since it is the defined term used for these devices in Article 100.

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Submittal Date: Mon Aug 28 15:16:01 EDT 2017

Public Input No. 3796-NFPA 70-2017 [Section No. 706.23(B)(3)]

(3) Energy Storage Systems Using ~~Utility-~~ Interactive Inverters.

Systems using ~~utility-~~ interactive inverters to control energy storage state-of-charge by diverting excess power into the ~~utility~~ electrical power production and distribution system shall comply with 706.23(B)(3)(a) and (B)(3)(b).

(a) These systems shall not be required to comply with 706.23(B)(2).

(b) These systems shall have a second, independent means of controlling the ESS charging process for use when the ~~utility~~ electrical power production and distribution is not present or when the primary charge controller fails or is disabled.

Statement of Problem and Substantiation for Public Input

In 690 utility-interactive inverter was dropped for interactive inverter since it may not be a utility that the inverter is connected too, it may be a electrical power production and distribution network that is not utility owned. Changes to the wording harmonize 706 with 690.

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Public Input No. 4276-NFPA 70-2017 [Section No. 706.23(B)(3)]

(3) Energy Storage Systems Using ~~Utility-~~ Interactive Inverters.

Systems using ~~utility-~~ interactive inverters to control energy storage state-of-charge by diverting excess power into ~~the utility system shall~~ an alternate electric power production source, such as a utility, shall comply with 706.23(B)(3)(a) and (B)(3)(b).

(a) These systems shall not be required to comply with 706.23(B)(2).

(b) These systems shall have a second, independent means of controlling the ESS charging process for use when the ~~utility~~ alternate connected source is not present or when the primary charge controller fails or is disabled.

Statement of Problem and Substantiation for Public Input

An interactive ESS may be connected to other interactive sources besides the utility. This proposed language clarifies that within this section.

Submitter Information Verification

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Submittal Date: Thu Sep 07 18:31:59 EDT 2017

Public Input No. 2762-NFPA 70-2017 [Section No. 706.30]

706.30 Installation of Batteries.

(A) Dwelling Units.

An ESS for dwelling units shall not exceed 100 volts between conductors or to ground.

Exception: Where live parts are not accessible during routine ESS maintenance, an ESS voltage exceeding 100 volts dc shall be permitted.

(B) ~~Disconnection of Series Battery Circuits~~ Maintenance Isolation and Disconnection .

~~Battery circuits~~ Where subject to field servicing, ~~where exceeding 240 volts nominal between conductors or to ground,~~ electrochemical battery circuits with a maximum voltage exceeding 100 volts dc shall have means of isolation that disconnects ungrounded and grounded circuit conductors of the battery circuit for maintenance. Battery circuits exceeding 240 volts dc shall have provisions to disconnect the series-connected strings into segments not exceeding ~~240 volts nominal~~ 240 volts dc for maintenance by qualified persons. ~~Non–load-~~ An isolating device shall not be required to simultaneously disconnect all current-carrying conductors of a circuit. Non-load- break bolted or plug-in disconnects shall be permitted ~~.~~

~~**(C)** Storage System Maintenance Disconnecting Means.~~

~~ESS exceeding 100 volts between conductors or to ground shall have a disconnecting means, accessible only to qualified persons, that disconnects ungrounded and grounded circuit conductor(s) in the electrical storage system for maintenance. This disconnecting~~ , and shall require a tool to access or open. These isolation means shall not disconnect the grounded circuit conductor(s) for ~~the remainder of~~ any other electrical system. ~~A non–load-break-rated switch shall be permitted to be used as a disconnecting means.~~

(D) Storage Systems of More Than 100 Volts.

On ESS exceeding 100 volts dc between the conductors or to ground, the battery circuits shall be permitted to operate with ungrounded conductors, provided a ground-fault detector and indicator is installed to monitor for ground faults within the storage system.

Statement of Problem and Substantiation for Public Input

The proposed revision is intended to address common confusion regarding the disconnection and segmentation of electrochemical battery strings for service and maintenance. First, while the previous B and C requirements are both related to safety for personnel during maintenance and service, the intent was not clear and often led to misinterpretation. By revising and combining both into a tiered structure the requirements are made more clear.

Where field servicing of battery cells is required, battery circuits greater than 100 volts need to have provisions that allow for the isolation of all current-carrying conductors of that circuit for maintenance. In addition, battery circuits exceeding 240 volts need to have means to segment the batteries into manageable segments. The means of isolation are not required to break all conductors simultaneously, the options for non-load-break bolted and plug-in disconnects are retained, and the requirement to not disconnect grounded circuit conductors for other systems is clarified.

A and D are revised to clarify that the requirements apply to dc battery circuits of electrochemical storage, not the ac output of an ac ESS.

This PI was developed by the PV Industry Forum (PVIF). For a description of the PVIF, please see PI-2751

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2761-NFPA 70-2017 [New Part after II.]	
Public Input No. 2757-NFPA 70-2017 [Section No. 706.7(D)]	

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Submittal Date: Fri Aug 25 18:21:11 EDT 2017

Public Input No. 3845-NFPA 70-2017 [Section No. 706.30]

706.30 Installation of Batteries.

(A) Dwelling Units.

An ESS for dwelling units shall not exceed 100 volts dc between conductors or to ground.

Exception: Where live parts are not accessible during routine ESS maintenance, an ESS voltage exceeding 100 volts dc shall be permitted.

(B) Disconnection of Series Battery Circuits.

Battery circuits subject to field servicing, where exceeding 240 volts dc nominal between conductors or to ground, shall have provisions to disconnect the series-connected strings into segments not exceeding 240 volts dc nominal for maintenance by qualified persons. Non–load-break bolted or plug-in disconnects shall be permitted.

(C) ~~Storage System~~ ESS Maintenance Disconnecting Means.

ESS exceeding 100 volts dc between conductors or to ground shall have a disconnecting means, accessible only to qualified persons, that disconnects ungrounded and grounded circuit conductor(s) in the electrical storage system for maintenance. This disconnecting means shall not disconnect the grounded circuit conductor(s) for the remainder of any other electrical system. A non–load-break-rated switch shall be permitted to be used as a disconnecting means.

(D) ~~Storage Systems~~ ESS of More Than 100 Volts dc .

On ESS exceeding 100 volts dc between the conductors or to ground, the battery circuits shall be permitted to operate with ungrounded conductors, provided a ground-fault detector and indicator is installed to monitor for ground faults within the storage system.

Statement of Problem and Substantiation for Public Input

706.30 needs to be explicit that the voltages given in the requirements for this section are the dc battery voltages and not the ac voltage output of the ESS.

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Public Input No. 2989-NFPA 70-2017 [Sections Part III., 706.30, 706.31, 706.32, 706.33, 706.34]

Sections Part III., 706.30, 706.31, 706.32, 706.33, 706.34

~~**Part III.** Electrochemical Energy Storage Systems~~

~~Part III of this article applies to ESSs that are comprised of sealed and non-sealed cells or batteries or system modules that are comprised of multiple sealed cells or batteries that are not components within a listed product.~~

> ~~Informational Note: An energy storage component, such as batteries, that are integrated into a larger piece of listed equipment, such as an uninterruptible power supply (UPS), are examples of components within a listed product.~~

~~**706.30** Installation of Batteries.~~

~~**(A)** Dwelling Units.~~

~~An ESS for dwelling units shall not exceed 100 volts between conductors or to ground.~~

~~*Exception: Where live parts are not accessible during routine ESS maintenance, an ESS voltage exceeding 100 volts shall be permitted.*~~

~~**(B)** Disconnection of Series Battery Circuits.~~

~~Battery circuits subject to field servicing, where exceeding 240 volts nominal between conductors or to ground, shall have provisions to disconnect the series-connected strings into segments not exceeding 240 volts nominal for maintenance by qualified persons. Non–load-break bolted or plug-in disconnects shall be permitted.~~

~~**(C)** Storage System Maintenance Disconnecting Means.~~

~~ESS exceeding 100 volts between conductors or to ground shall have a disconnecting means, accessible only to qualified persons, that disconnects ungrounded and grounded circuit conductor(s) in the electrical storage system for maintenance. This disconnecting means shall not disconnect the grounded circuit conductor(s) for the remainder of any other electrical system. A non–load-break-rated switch shall be permitted to be used as a disconnecting means.~~

~~**(D)** Storage Systems of More Than 100 Volts.~~

~~On ESS exceeding 100 volts between the conductors or to ground, the battery circuits shall be permitted to operate with ungrounded conductors, provided a ground-fault detector and indicator is installed to monitor for ground faults within the storage system.~~

~~**706.31** Battery and Cell Terminations.~~

~~**(A)** Corrosion Prevention.~~

~~Antioxidant material suitable for the battery connection shall be used when recommended by the battery or cell manufacturer.~~

> ~~Informational Note: The battery manufacturer's installation and instruction manual can be used for guidance for acceptable materials.~~

~~**(B)** Intercell and Intertier Conductors and Connections.~~

~~The ampacity of field-assembled intercell and intertier connectors and conductors shall be of such cross-sectional area that the temperature rise under maximum load conditions and at maximum ambient temperature shall not exceed the safe operating temperature of the conductor insulation or of the material of the conductor supports.~~

> ~~Informational Note: Conductors sized to prevent a voltage drop exceeding 3 percent of maximum anticipated load, and where the maximum total voltage drop to the furthest point of connection does not exceed 5 percent, may not be appropriate for all battery applications. IEEE 1375-2003, *Guide for the Protection of Stationary Battery Systems,* provides guidance for overcurrent protection and associated cable sizing.~~

~~**(C)** Battery Terminals.~~

~~Electrical connections to the battery and the cable(s) between cells on separate levels or racks shall not put mechanical strain on the battery terminals. Terminal plates shall be used where practicable.~~

~~**706.32** Battery Interconnections.~~

~~Flexible cables, as identified in Article 400 , in sizes 2/0 AWG and larger shall be permitted within the battery enclosure from battery terminals to a nearby junction box where they shall be connected to an approved wiring method. Flexible battery cables shall also be permitted between batteries and cells within the battery enclosure. Such cables shall be listed and identified as moisture resistant. Flexible, fine-stranded cables shall only be used with terminals, lugs, devices, or connectors in accordance with 110.14 .~~

~~**706.33** Accessibility.~~

~~The terminals of all cells or multicell units shall be readily accessible for readings, inspection, and cleaning where required by the equipment design. One side of transparent battery containers shall be readily accessible for inspection of the internal components.~~

~~**706.34** Battery Locations.~~

~~Battery locations shall conform to 706.34(A) , (B), and (C).~~

~~**(A)** Live Parts.~~

~~Guarding of live parts shall comply with 110.27 .~~

~~**(B)** Top Terminal Batteries.~~

~~Where top terminal batteries are installed on tiered racks or on shelves of battery cabinets, working space in accordance with the storage equipment manufacturer's instructions shall be provided between the highest point on a storage system component and the row, shelf, or ceiling above that point.~~

> ~~Informational Note: IEEE 1187 provides guidance for top clearance of VRLA batteries, which are the most commonly used battery in cabinets.~~

~~**(C)** Gas Piping.~~

~~Gas piping shall not be permitted in dedicated battery rooms.~~

Statement of Problem and Substantiation for Public Input

This public input is the result of an Energy Storage Task Group that was put together by CMP 13 to correlate Article 706, Energy Storage Systems and Article 480, Batteries. Various sections between the two articles were redundant while certain sections in Article 706 strictly pertained to batteries and were better suited in the Battery article. It was also the charge of the task group to better define Energy Storage Systems. The Task Group members were Larry Ayer, Jim Dollard, Dan Neeser, Mario Spina, Tim Croushore, Bill Cantor, Chad Kennedy, Steve Froemming, John Kovacik and Dan Caron.

This specific public input deletes various sections in Article 706 that pertain to batteries.
1. 706.30 is deleted since this deal with the installation of batteries.
2. 706.30(A) is relocated to 706.10(A)
3. 706.30(B) is relocated to 480.7(B).
4. 706.30(C) is being relocated to 706.7(A).
5. 706.30(D) is being relocated to 706.10(B).
6. 706.31(A), (B), and (C) pertain to batteries and are being deleted since this is covered in Article 480..
7. 706.32 Battery Interconnections is being relocated to Article 480.
8. 706.33 is being deleted since it is already covered in Article 480.
9. 706.34 Battery locations is being deleted since this is already covered in Article 480.

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Public Input No. 3800-NFPA 70-2017 [Section No. 706.30(A)]

(A) – **One and Two Family** Dwelling Units.

An ESS for one and two family dwelling units shall not exceed 100 volts between conductors or to ground.

Exception: Where live parts are not accessible during routine ESS maintenance, an ESS voltage ~~exceeding 100 volts~~ up to 600V volts shall be permitted.

Statement of Problem and Substantiation for Public Input

Traditionally one and two family dwellings have been limited to 600Vdc for battery storage. I am apprehensive with having an unlimited battery voltage in this case. While I have changed it to 600V maybe 1,000V would also be a good choice, just not unlimited.
The modifier one and two family was added to dwellings to delineate them from large multi-family complexes which will ahve commercial battery systems.

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Public Input No. 3803-NFPA 70-2017 [Section No. 706.31(B)]

(B) Intercell and Intertier Conductors and Connections.

The ampacity of field-assembled intercell and intertier connectors and conductors shall be of such cross-sectional area that the temperature rise under maximum load conditions and at maximum ambient temperature shall not exceed the safe operating temperature of the conductor insulation or of the material of the conductor supports.

Informational Note: ~~Conductors sized to prevent a voltage drop exceeding 3 percent of maximum anticipated load, and where the maximum total voltage drop to the furthest point of connection does not exceed 5 percent, may not be appropriate for all battery applications.~~ ~~IEEE~~ IEEE 1375-2003, *Guide for the Protection of Stationary Battery Systems,* provides guidance for overcurrent protection and associated cable sizing.

Statement of Problem and Substantiation for Public Input

The deleted text is teaching how to perform a battery system design and is not in compliance with the NEC Style Manual.

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Public Input No. 3805-NFPA 70-2017 [Section No. 706.34(C)]

(C) ~~Gas Piping.~~

~~Gas piping~~

Classified Locations

Dedicated battery rooms shall not be ~~permitted in dedicated battery rooms.~~ designated Class I, II, III locations as defined in section 500.5.

Exception: Self-contained ESS listed for use in the appropriate class of classified location shall be allowed.

Statement of Problem and Substantiation for Public Input

The bigger picture goes beyond gas piping. We should be controlling battery installations in classified locations. This would include gas piping and many other possible hazards.

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Public Input No. 2828-NFPA 70-2017 [New Section after 708.2]

708.3 Signage.

Permanent signs shall be permanently applied on electrical equipment to give notice to personnel during servicing that the electrical system is classified as Critical Operation Power System (COPS). The signage shall comply with 110.21(B).

Statement of Problem and Substantiation for Public Input

Propose identification means to be added under new section to identify that such premises is served by COPS so future maintenance and ulterations will continue to comply with the electrical system requirement.

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Public Input No. 2937-NFPA 70-2017 [Global Input]

Replace
the term “Power Production Facility” with “Supply
Station” throughout article 691.

Additional Proposed Changes

File Name	Description	Approved
PV_Industry_Forum.pdf		✓

Statement of Problem and Substantiation for Public Input

The term “power production facility” is only used in the title and scope of 691, and is inconsistent with the term “supply station” which is used 12 times throughout article 691.

A taskforce has been developed between the NEC and NESC to align on key terms and definitions. Utilizing the term “Supply Station” better aligns the NEC and NESC on this term which is describing the same equipment set in both codes.

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Submittal Date: Tue Aug 29 12:29:17 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:

<u>Coordinating committee:</u>
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
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Mark Baldassari, Enphase Energy
Ward Bower, Ward Bower Innovations
Bill Brooks, PVICC
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Sagar Khare, Maxim Integrated
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Paul Robusto, MiaSole
Mark Rodriguez, Sunrun
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Public Input No. 2936-NFPA 70-2017 [Section No. 708.5]

708.5 Physical and Cyber Security.

~~Physical security~~ Security shall be provided for critical operations power systems in accordance with 708.5(A) ~~and~~ , (B) and (C) .

(A) Risk Assessment.

Based on the results of the risk assessment, a strategy for providing physical security for critical operations power systems shall be developed, documented, and implemented.

(B) Restricted Access.

Electrical circuits and equipment for critical operations power systems shall be accessible to qualified personnel only.

(C) Cyber Security

Electrical Products which are connectable for information transfer, shall be Listed. The Listing shall also include assessment for vulnerabilities, software weaknesses and malware.

Statement of Problem and Substantiation for Public Input

Article 708 addresses Critical Operations Power Systems, COPS. As noted in Information Note 1 to 708.1, the incapacitation of these systems "…would disrupt national security, the economy, public health or safety." Given the critical importance, the electrical components of these systems need to be verified against one of the fastest growing safety concerns, cyber-threats.

There is a Presidential Policy Directive on "Critical Infrastructure Security and Resilience", PPD-21, which states:" It is the policy of the United States to strengthen the security and resilience of its critical infrastructure against both physical and cyber threats."

In 2011, the US Department of Energy (DOE) publically presented "Working to Achieve Cybersecurity in the Energy Sector," with specific recommendations that included:

- Proactively require vendors, technology providers and integrators for security assurances and features
- Design in checks and balances
- Third party validation of security measures

This Public Input would satisfy these DOE recommendations by requiring that susceptible electrical products be Listed to address this issue when used in Critical Operations Power Systems.

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Submittal Date: Tue Aug 29 11:50:21 EDT 2017

Public Input No. 380-NFPA 70-2017 [Section No. 708.6(B)]

(B) Tested Periodically.

Systems shall be tested periodically on a ~~schedule acceptable to the~~ schedule approved by the authority having jurisdiction to ensure the systems are maintained in proper operating condition.

Statement of Problem and Substantiation for Public Input

This change is not a technical change. It is intended to be editorial only. This revision is merely an attempt to provide consistent terminology throughout the code. I believe the better word to use in this instance is the term “approved” since it is defined in Article 100 and used throughout the code and generally understood by installers and inspectors alike.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 379-NFPA 70-2017 [Section No. 701.12(B)(3)]	use of term "approved" versus "acceptable"
Public Input No. 378-NFPA 70-2017 [Section No. 700.3(B)]	use of term "approved" versus "acceptable"
Public Input No. 377-NFPA 70-2017 [Section No. 701.12(B)(1)]	use of term "approved" versus "acceptable"
Public Input No. 376-NFPA 70-2017 [Section No. 701.3(B)]	use of term "approved" versus "acceptable"
Public Input No. 375-NFPA 70-2017 [Section No. 700.12(B)(3)]	use of term "approved" versus "acceptable"
Public Input No. 374-NFPA 70-2017 [Section No. 700.12(B)(1)]	use of term "approved" versus "acceptable"
Public Input No. 373-NFPA 70-2017 [Section No. 820.44(D)]	use of term "approved" versus "acceptable"

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Public Input No. 176-NFPA 70-2017 [Section No. 708.14]

708.14 Wiring of HVAC, Fire Alarm, Security, Emergency Communications, and Signaling Systems.

All conductors or cables shall be installed using any of the metal wiring methods permitted by 708.10(C)(1) and, in addition, shall comply with 708.14(1) through (8), as applicable.

(1) All cables for fire alarm, security, signaling systems, and emergency communications shall be shielded twisted pair cables or installed to comply with the performance requirements of the system.

(2) Shields of cables for fire alarm, security, signaling systems, and emergency communications shall be arranged in accordance with the manufacturer's published installation instructions.

(3) Optical fiber cables shall be used for connections between two or more buildings on the property and under single management.

(4) A listed primary protector shall be provided on all communications circuits. Listed secondary protectors shall be provided at the terminals of the communications circuits.

(5) Conductors for all control circuits rated above 50 volts shall be rated not less than 600 volts.

(6) Communications, fire alarm, and signaling circuits shall use relays with contact ratings that exceed circuit voltage and current ratings in the controlled circuit.

(7) All cables for fire alarm, security, and signaling systems shall be riser-rated and shall be a listed 2-hour electrical circuit protective system. Emergency ~~communication~~ communications cables shall be Type CMR-CI or shall be riser-rated and shall be a listed 2-hour electrical circuit protective system.

(8) Control, monitoring, and power wiring to HVAC systems shall be a listed 2-hour electrical circuit protective system.

Statement of Problem and Substantiation for Public Input

This PI is editorial. “Communication” should be plural, “communications”.

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Public Input No. 3412-NFPA 70-2017 [Section No. 708.20(A)]

(A) General Requirements.

Current supply shall be such that, in the event of failure of the normal supply to the DCOA, critical operations power shall be available within the time required for the application. The supply system for critical operations power, in addition to the normal services to the building and meeting the general requirements of this section, shall be one or more of the types of systems described in 708.20(E) through (H).

Informational Note 1 : Assignment of degree of reliability of the recognized critical operations power system depends on the careful evaluation in accordance with the risk assessment.

Informational Note 2: For guidance about determining degree of reliability see IEEE 3006.5 Recommended Practice for the Use of Probability Methods for Conducting a Reliability Analysis of 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 IEEE 493 Design of Reliable Industrial and Commercial Power Systems -- the so-called "Gold Book", which is now being sunsetted and superseded by 3006.5.

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/3006.5-2014.html

Submitter Information Verification

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Copyright Assignment

I, Michael Anthony, 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 Anthony, 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. 4106-NFPA 70-2017 [Section No. 708.24]

708.24 Transfer Equipment.

(A) General.

Transfer equipment, including automatic transfer switches, shall be automatic and identified for emergency use. Transfer equipment shall be designed and installed to prevent the inadvertent interconnection of normal and critical operations sources of supply in any operation of the transfer equipment. Transfer equipment and electric power production systems installed to permit operation in parallel with the normal source shall meet the requirements of Article 705.

(B) Bypass Isolation Switches.

Means shall be permitted to bypass and isolate the transfer equipment. Where bypass isolation switches are used, inadvertent parallel operation shall be avoided.

(C) Automatic Transfer Switches.

Where used with sources that are not inherently synchronized, automatic transfer switches shall comply with (C)(1) and (C)(2).

(1) Automatic transfer switches shall be listed for emergency use.

(2) Automatic transfer switches shall be electrically operated and mechanically held.

(D) Bypass Isolation Automatic Transfer Switches.

Where loads are capable of being supplied by only one automatic transfer switch, the automatic transfer switch shall be equipped with a bypass isolation switch to faciliate maintenance as required in 708.6(C) without jeopardizing continuity of power. When the bypass isolation transfer switch is in the by pass mode, either it shall automatically initate transfer between power sources upon loss of the connected power source or it shall remain actively supervised by a qualified person who can manually initiate a transfer between power sources.

(E) Use.

Transfer equipment shall supply only COPS loads.

(~~E~~ F) Documentation.

The short-circuit current rating of the transfer equipment, based on the specific overcurrent protective device type and settings protecting the transfer equipment, shall be field marked on the exterior of the transfer equipment.

Statement of Problem and Substantiation for Public Input

In some cases, designs provide means to put ATS in an electrically safe work condition so that ATS maintenance can be performed safely and the COPS loads are still powered. If a COPS design has loads that can only be supplied via one ATS, the maintenance may not get done or is done in an unsafe manner. Bypass isolation switches provide redundancy and continuous powering of the loads while the ATS is de-energized so that proper maintenance can be performed under safe work conditions. However, while in the bypass mode, if the connected power source fails, it is necessary to quickly transfer between power sources, This should be achieved either via an automatic bypass isolation switch or a person standing ready to manually operate the bypass isolation switch to other source.

Submitter Information Verification

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Copyright Assignment

Public Input No. 2087-NFPA 70-2017 [Section No. 708.54]

708.54 Selective Coordination.

Critical operations power system(s) overcurrent protective devices shall be selectively coordinated with all supply-side overcurrent protective devices.

Selective coordination shall be selected by a licensed professional engineer or other qualified persons engaged primarily in the design, installation, or maintenance of electrical systems. The selection shall be documented and made available to those authorized to design, install, inspect, maintain, and operate the system.

Exception ~~:~~ ~~Selective coordination shall not be required between two overcurrent devices located in series if no loads are connected in parallel with the downstream device~~ No. 1: Between transformer primary and secondary overcurrent protective devices, where only one overcurrent protective device or set of overcurrent protective devices exists on the transformer secondary.

Exception No. 2: Between overcurrent protective devices of the same size (ampere rating) in series .

Statement of Problem and Substantiation for Public Input

There are two conditions where selective coordination is not possible, overcurrent devices in series and overcurrent devices on the primary and the secondary of a transformer. As currently worded, the exception does not specifically address both these conditions. This proposed revision addresses both conditions (two overcurrent devices in series and overcurrent devices on the primary and secondary of a transformer) and provides clear language for both conditions. In an attempt to achieve consistency between all NEC sections that require selective coordination, similar revisions will be proposed for the following sections:

NEC 620.62
NEC 645.27
NEC 695.3(C)(3)
NEC 700.32
NEC 701.27

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Public Input No. 296-NFPA 70-2017 [Part IV.]

Part IV. Overcurrent ~~Protection~~ Protection Relocate this to Article 240.

Statement of Problem and Substantiation for Public Input

All overcurrent protection requirements should be consolidated in Article 240 for more convenient reading and to have all overcurrent protection under one code making panel.

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Public Input No. 1296-NFPA 70-2017 [Section No. 712.72]

712.72 Interrupting and Short-Circuit Current Ratings.

Consideration shall be given to the contribution of ~~short-circuit~~ available fault currents from all interconnected power sources for the interrupting ratings and short-circuit current ratings of equipment in the dc microgrid system(s). Overcurrent protective devices and equipment used within a dc microgrid shall have an interrupting rating at nominal circuit voltage or a short-circuit current rating sufficient for the available ~~short-circuit~~ fault current at the line terminals of 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 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. 1249-NFPA 70-2017 [Section No. 110.24(A)]	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. 1297-NFPA 70-2017 [Definition: Feeder Neutral Conductor]	PI from Fault Current Working Group

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Public Input No. 3865-NFPA 70-2017 [Article 712]

Article 712 Direct Current Microgrids

Part I. General

712.1 Scope.

This article applies to direct current microgrids.

712.2 Definitions.

Direct Current Microgrid (DC Microgrid).

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

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

Grounded Two-Wire DC System

A system that has a solid connection or ~~reference~~ functionally -ground between one of the current carrying conductors and the equipment grounding system.

Grounded Three-Wire DC System.

A system with a solid connection ~~or reference~~ or functionally -ground between the center point of a bipolar dc power source and the equipment grounding system.

Nominal Voltage.

A value assigned to a circuit or system for the purpose of conveniently designating its dc voltage class.

> Informational Note: The actual voltage at which a circuit operates can vary from the nominal voltage within a range that permits satisfactory operation of equipment.

~~Reference~~ Functionally -Grounded DC System.

A system that is not solidly grounded but ~~has a low-resistance electrical reference that maintains voltage~~ maintains a connection to ground in normal operation.

Resistively Grounded.

A system with a high-resistance connection between the current carrying conductors and the equipment grounding system.

Primary DC Source.

A source that supplies the majority of the dc load in a dc microgrid.

Ungrounded DC System.

A system that has no direct or resistive connection between the current carrying conductors and the equipment grounding system.

712.3 Other Articles.

Wherever the requirements of other articles of this *Code* and Article 712 differ, the requirements of Article 712 shall apply. DC microgrids interconnected through an inverter or bi-directional converter with ac electric power production sources shall comply with Article 705.

712.4 Listing and Labeling.

Any equipment used in the dc circuits of a direct-current micro grid shall be listed and labeled for dc use.

712.10 Directory.

A permanent directory denoting all dc electric power sources operating to supply the dc microgrid shall be installed at each source location capable of acting as the primary dc source.

Part II. Circuit Requirements

712.25 Identification of Circuit Conductors

(A)

Ungrounded circuit conductors in dc microgrids shall be identified according to the requirements of 210.5(C)(2) for branch circuits and 215.12(C)(2) for feeders.

(B)

Ungrounded conductors of 6 AWG or smaller shall be permitted to be identified by polarity at all termination, connection, and splice points by marking tape, tagging, or other approved means.

712.30 System Voltage.

The system voltage of a dc microgrid shall be determined by one of the following methods:

(1) The nominal voltage to ground for solidly grounded systems

(2) The nominal voltage to ground for ~~reference~~ functionally -grounded systems

(3) The highest nominal voltage between conductors for resistively grounded dc systems and ungrounded dc systems.

Informational Note: Examples of nominal dc system voltages include but are not limited to 24, 48, 125, 190/380, or 380 volts.

Part III. Disconnecting Means

712.34 DC Source Disconnecting Means.

The output of each dc source shall have a readily accessible, disconnecting means that is lockable in the open position and adjacent to the source.

712.35 Disconnection of Ungrounded Conductors.

In solidly grounded two- and three-wire systems, the disconnecting means shall simultaneously open all ungrounded conductors. In ungrounded, resistively grounded and ~~reference~~ functionally -grounded systems, such devices shall open all current-carrying conductors.

712.37 Directional Current Devices.

Disconnecting means shall be listed, be marked for use in a single current direction, and only be used in the designated current direction.

Informational Note: Examples of directional current devices are magnetically quenched contactors and semiconductor switches in overcurrent devices.

Part IV. Wiring Methods

712.52 System Grounding.

(A) General.

Direct-current microgrids shall be grounded in accordance with 250.162.

(B) Over 300 Volts.

DC microgrids operating at voltages greater than 300 volts dc shall be ~~reference~~ functionally -grounded dc systems or resistively grounded dc systems.

712.55 Ground Fault Detection Equipment.

Ungrounded, ~~reference~~ functionally grounded, or resistively grounded dc microgrids operating at greater than 60 volts dc shall have ground fault detection that indicates that a fault has occurred. The ground fault equipment shall be marked in accordance with 250.167(C).

712.57 Arc Fault Protection.

Where required elsewhere in this *Code*, specific systems within the DC microgrid shall have arc fault protection. The arc fault protection equipment shall be listed.

Informational Note: Section 90.4 applies when suitable equipment for arc fault protection is not available.

Part V. Marking

712.62 Distribution Equipment and Conductors.

Distribution equipment and conductors shall be marked as required elsewhere in this *Code*.

712.65 Available DC Short-Circuit Current.

(A) Field Marking.

The maximum available dc short-circuit current on the dc microgrid shall be field marked at the dc source(s). The field marking(s) shall include the date the short-circuit current calculation was performed and be of sufficient durability to withstand the environment involved.

(B) Modifications.

When modifications to the electrical installation occur that affect the maximum available short-circuit current at the dc source, the maximum available short-circuit current shall be verified or recalculated as necessary to ensure the equipment ratings are sufficient for the maximum available short-circuit current at the line terminals of the equipment. The required field marking(s) in 712.65(A) shall indicate the new maximum available short-circuit current and date.

Part VI. Protection

712.70 Overcurrent Protection.

Equipment and conductors connected to more than one electrical source shall have overcurrent protective devices to provide protection from all sources.

712.72 Interrupting and Short-Circuit Current Ratings.

Consideration shall be given to the contribution of short-circuit currents from all interconnected power sources for the interrupting ratings and short-circuit current ratings of equipment in the dc microgrid system(s). Overcurrent protective devices and equipment used within a dc microgrid shall have an interrupting rating at nominal circuit voltage or a short-circuit current rating sufficient for the available short-circuit current at the line terminals of the equipment.

Part VII. Systems over 1000 Volts

712.80 General.

Systems with a maximum voltage between conductors of over 1000 volts dc shall comply with Article 490 and other requirements in this *Code* applicable to installations rated over 1000 volts.

Statement of Problem and Substantiation for Public Input

The term “reference grounded” was revised to “functionally grounded” in Article 690 of the final version of the 2017 NEC but the change was not correlated into Article 712.
Functionally grounded is a more descriptive term for these grounding systems.
The term “low resistance electrical reference” in the definition is confusing – the revised language more clearly describes the behavior of the grounding system.

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Copyright Assignment

Public Input No. 3874-NFPA 70-2017 [Section No. 712.1]

712.1 Scope.

This article applies to direct current microgrids and the interconnection of dc power sources .

Statement of Problem and Substantiation for Public Input

This change complements PI 3872 which proposes that Article 705 address ac source and power system interconnection and that Article 712 address dc source interconnection.
This distinction will simplify the requirements in 705 while also creating a clear location for dc source interconnection requirements.

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Public Input No. 3866-NFPA 70-2017 [New Section after 712.4]

712.6 DC Microgrids and Emergency Systems

DC microgrids that are used to power emergency systems shall not be required to meet requirements of 700.5(A) that t ransfer equipment shall be installed to prevent the inadvertent interconnection of normal and emergency sources.

Statement of Problem and Substantiation for Public Input

700.5(A) requires that "Transfer equipment shall be designed and installed to prevent the inadvertent interconnection of normal and emergency sources" however power from a dc microgrid can meet other requirements of Article 700 without requiring a transfer switch as the normal and emergency sources are one and the same. A companion PI has been submitted to state the same concept in 700.5(A).

We are entering a time of new and different electric power systems - many will be dc microgrids with integral storage and multiple interconnected power sources. We need to provide for these systems. There are dc microgrid systems undergoing UL certification now for operation as Article 700 emergency systems.

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Public Input No. 4361-NFPA 70-2017 [New Section after 712.72]

Self Discharge Rate Limit

All DC/DC nodes connected to a branch circuit shall discharge their line voltage to benign levels within 3 minutes of being disconnected.

Statement of Problem and Substantiation for Public Input

In a resistive midpoint grounded system, the midpoint grounding resistors are typically in-front of the branch circuit breakers and cannot act as bleeding resistors to the loads attached to the down-stream of the circuit breakers.

Most DC/DC converters, especially non-isolated, will have capacitances between V+ and V- and V+ to GND or V- to GND. If you have a branch circuit which has, for example, +20 nodes attached to it with input capacitances of 500nF, that will add up to 10uF easily. Now, granted, capacitance between V+ and V- will be drained by the internal circuitry (hopefully). But if a converter has a capacitance between V+ to GND or V- to GND and does not have bleeding resistors built into the device or the system, the line voltage could exceed over 100V measured to ground and can be held up for hours. With enough nodes on a branch circuit the energy behind these capacitors could add up to substantial amounts.

With the advent of DC Micorgrids, DC loads with new DC architectures, it is prudent to specify some self discharge rates to protect the people servicing these systems. This will ensure that DC Microgrid system designers and DC Microgrid product developers are cognizant of the fact that voltage cannot remain on the branch circuits after it has been disconnected.

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Public Input No. 3601-NFPA 70-2017 [Section No. 712.10]

712.~~10~~ ~~Directory~~ 10 Identification of Power Sources .

(A) Source Directory. A permanent directory denoting all dc electric power sources operating to supply the dc microgrid shall be installed at each source location capable of acting as the primary dc source.

(B) Building Directory. A building supplied by a dc microgrid system shall have a permanent plaque or directory installed outside the building at each service equipment location or at an approved readily visible location. The plaque or directory shall denote the location of each power source disconnecting means on or in the building or be grouped with other plaques or directories for other on-site sources.

Exception: Installations with large numbers of power production sources shall be permitted to be designated by groups.

Statement of Problem and Substantiation for Public Input

This public input addresses ongoing concerns expressed by the fire service and other first responders on the need to secure on-site power sources during emergencies and awareness of where those sources are. Effective means of securing utility sources have long been established by local fire departments however there is a lack of uniform procedures in how to effectively secure on-site power sources that may be at a premises due to the variety of different source types, the rapid rate of product adoption, and varied or absent Code language addressing notice on the location of specific sources. This proposed change is part of a grouping of proposals that will correlate various sections of the NEC and consistently require this important marking be located outside a building regardless of whether the utility service equipment is located indoors or outdoors. This will provide warnings to first responders about the presence and location of on-site power sources prior to entering a building. Since dc microgrid systems may be located in buildings with utility services, a reference to the service equipment location has been included. If service equipment is not located outdoors, a unique outdoor location is intentionally not specified to allow for adaptation to specific site conditions however it is clear that any final location must be readily visible (not hidden) and approved by the AHJ. Additionally this plaque or directory must identify the location of all power source disconnecting means or be grouped with other (i.e. existing) signs at the same location. We feel any requirement to include duplicate markings at all source disconnects is not needed with these new changes to require that all sources are identified in a single outdoor location. The requirements in 110.21(B) apply to all field-applied hazard markings such as these so it is not necessary to explicitly repeat that here. The exception has been included to provide allowances for practical groupings in larger installations. This proposed language aligns with our proposed language changes in 705.10 and is similar to our new proposed language in 710.10. Our goal is to harmonize all similar requirements.
This input has been developed and is supported by Tesla, who manufactures and installs both PV and energy storage equipment as well as Robert J. Davidson of Davidson Code Concepts. LLC. Complementary language is also being submitted by this team to fire and building Codes as appropriate in an attempt to harmonize these requirements across all relevant Codes.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3561-NFPA 70-2017 [Section No. 705.10]	Similar text for interconnected ac source applications
Public Input No. 3599-NFPA 70-2017 [New Section after 710.6]	Similar text for stand-alone system applications
Public Input No. 3702-NFPA 70-2017 [Section No. 706.11]	Addresses on-site ESS sources
Public Input No. 3713-NFPA 70-2017 [Section No. 690.56(A)]	Addresses on-site PV sources in Stand-alone systems
Public Input No. 3717-NFPA 70-2017 [Section No. 690.56(B)]	Addresses on-site PV sources in utility interactive systems
Public Input No. 3724-NFPA 70-2017 [Section No. 690.56(C)(1)]	Addresses PV rapid shutdown placarding requirements

Public Input No. 3729-NFPA 70-2017 [New Section after 480.7(D)]	Addresses on-site battery sources
Public Input No. 3731-NFPA 70-2017 [Section No. 445.11]	Addresses on-site generator sources
Public Input No. 3735-NFPA 70-2017 [Section No. 694.22(C)(2)]	Addresses marking of on-site wind generator disconnects with placards.
Public Input No. 3736-NFPA 70-2017 [Section No. 694.54]	Addresses on-site wind generator sources
Public Input No. 3746-NFPA 70-2017 [Section No. 692.4(B)]	Addresses on-site fuel cell sources

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Public Input No. 3859-NFPA 70-2017 [Section No. 712.10]

712.10 Directory.

A permanent directory denoting all dc electric power sources operating to supply the dc microgrid shall be installed at the location of each source ~~location~~ capable of acting as the primary dc source.

Statement of Problem and Substantiation for Public Input

Editorial - a location is not capable of acting as a source.

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Public Input No. 1970-NFPA 70-2017 [Section No. 712.2]

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

Direct Current Microgrid (DC Microgrid).

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

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

Grounded Two-Wire DC System

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

Grounded Three-Wire DC System.

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

Nominal Voltage.

A value assigned to a circuit or system for the purpose of conveniently designating its dc voltage class.

Informational Note: The actual voltage at which a circuit operates can vary from the nominal voltage within a range that permits satisfactory operation of equipment.

Reference-Grounded DC System.

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

Resistively Grounded.

A system with a high-resistance connection between the current carrying conductors and the equipment grounding system.

Primary DC Source.

A source that supplies the majority of the dc load in a dc microgrid.

Ungrounded DC System.

A system that has no direct or resistive connection between the current carrying conductors and the equipment grounding system.

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.

Related Public Inputs for This Document

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

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Public Input No. 3861-NFPA 70-2017 [Section No. 712.25]

712.25 Identification of Circuit Conductors

~~**(A)**~~

Ungrounded circuit conductors in dc microgrids shall be identified according to the requirements of 210.5(C)(2) for branch circuits and 215.12(C)(2) for feeders.

~~**(B)**~~

~~Ungrounded conductors of 6 AWG or smaller shall be permitted to be identified by polarity at all termination, connection, and splice points by marking tape, tagging, or other approved means.~~

Statement of Problem and Substantiation for Public Input

712.25(B) is no longer required as similar language was incorporated into 210.5(C)(2) for branch circuits and 215.12(C)(2) for feeders in the 2017 NEC.

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Public Input No. 1586-NFPA 70-2017 [Section No. 712.34]

712.34 DC Source Disconnecting Means.

The output of each dc source shall have a readily accessible, disconnecting means that is lockable ~~in the open position~~ open in accordance with 110.25 and adjacent to the source.

Statement of Problem and Substantiation for Public Input

Aligns the text with 110.25

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Public Input No. 3862-NFPA 70-2017 [Section No. 712.34]

712.34 DC Source Disconnecting Means.

The output of each dc source shall have a readily accessible ~~,~~ disconnecting means that is lockable in the open position and adjacent to the source.

Statement of Problem and Substantiation for Public Input

Editorial - remove the unnecessary comma.

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Public Input No. 3864-NFPA 70-2017 [Section No. 712.37]

712.37 Directional Current Devices.

Disconnecting means ~~shall be listed, be~~ or overcurrent devices that are listed or marked for use in a single current direction ~~, and~~ shall only be used in the designated current direction. Disconnecting means or overcurrent devices for bi-directional sources or loads shall be listed or marked for bi-directional operation.

Informational Note: Examples of directional current devices are magnetically quenched contactors and semiconductor switches in overcurrent devices. An example of a bi-directional source is a battery energy storage system.

Statement of Problem and Substantiation for Public Input

712.37 if taken literally would require that all disconnecting means should be marked for use in a single current direction (which is clearly not the intent).
Directional devices WILL be listed or marked for directional operation - the revised language states that application should comply with the listing or marking.
Overcurrent devices were added as many dc circuit breakers are dc-quenched and listed for directional operation only.
The additional sentence clarifies that bi-directional sources or loads require bi-directional switchgear.

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Public Input No. 3868-NFPA 70-2017 [Section No. 712.4]

712.4 Listing and Labeling.

Any equipment used in the dc circuits of a direct-current ~~micro grid~~ microgrid shall be listed and labeled for dc use.

Statement of Problem and Substantiation for Public Input

Editorial - Microgrid is one word

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Public Input No. 4188-NFPA 70-2017 [Section No. 712.62]

712.62 Distribution Equipment and Conductors.

Distribution equipment and conductors shall be marked as required elsewhere in this *Code*.

Marking according to 690.31 for photovoltaic system conductors shall not be required beyond the connection to dc microgrid distribution equipment or the final disconnecting means feeding a utilization load.

Statement of Problem and Substantiation for Public Input

There is a demarcation issue between PV system conductors and dc microgrid systems that has resulted in entire dc distribution systems being marked every 10 feet.
This is addressed in revised PIs for PV Systems and output conductors, but should also be stated in 712 to clarify the overall requirements.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 4140-NFPA 70-2017 [Section No. 690.2]	related issue
Public Input No. 4179-NFPA 70-2017 [Definition: Photovoltaic (PV) System.]	related issue

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Public Input No. 1295-NFPA 70-2017 [Section No. 712.65]

712.65 Available DC ~~Short-Circuit~~ Fault Current.

(A) Field Marking.

The ~~maximum~~ available dc ~~short-circuit~~ fault current on the dc microgrid shall be field marked at the dc source(s). The field marking(s) shall include the date the ~~short-circuit~~ available fault current calculation was performed and be of sufficient durability to withstand the environment involved.

(B) Modifications.

When modifications to the electrical installation occur that affect the ~~maximum~~ available ~~short-circuit~~ fault current at the dc source, the ~~maximum~~ available ~~short-circuit~~ fault current shall be verified or recalculated as necessary to ensure the equipment ratings are sufficient for the ~~maximum~~ available ~~short-circuit~~ fault current at the line terminals of the equipment. The required field marking(s) in 712.65(A) shall indicate the new ~~maximum~~ available ~~short-circuit~~ fault current and date.

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. 1249-NFPA 70-2017 [Section No. 110.24(A)]	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. 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

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Public Input No. 4121-NFPA 70-2017 [Section No. 712.65]

712.65 Available DC Short-Circuit Current.

(A) ~~Field~~ Marking.

The maximum available dc short-circuit current ~~on the~~ from a dc ~~microgrid~~ source shall be either field ~~marked~~ -marked at the dc source(s) ~~. The field marking(s) shall include the date the~~ or be incorporated in the equipment label.

(B) Short-circuit current calculation

In systems with multiple power parallel sources where the aggregate fault current exceeds the rating of any particular piece of equipment, the maximum available short-circuit current ~~calculation was performed and be of sufficient durability to withstand the environment involved~~ shall be verified or recalculated to ensure the equipment fault current ratings are sufficient .

(~~B~~ C) Modifications.

When modifications to ~~the~~ an electrical installation occur that affect the maximum available short-circuit current ~~at the dc source~~ , the maximum available short-circuit current shall be verified or recalculated as necessary to ensure ~~the equipment ratings are sufficient for the maximum available short-circuit current at the line terminals of the equipment. The required field marking(s) in~~ compliance with 712.65(~~A) shall indicate the new maximum available short-circuit current and date~~ B) .

Statement of Problem and Substantiation for Public Input

This clarifies that the requirements are not for source fault current but for the fault current ratings of disconnect, overcurrent and utilization equipment.
It further only requires fault calculations (which are complex in dc microgrid networks) where the aggregate source short circuit current exceeds device fault current ratings.
Most dc microgrid sources are inherently current limited (e.g. rectifiers, dc-dc converters and PV modules).
The exception is fuse or breaker-connected battery systems where available short circuit current will be related to the fuse or breaker let-through current and the impedance between source and the fault location. Most battery systems however will incorporate dc-dc converters between battery and the microgrid bus.
The marking requirement was changed to each source rather than the microgrid as a whole.
The requirements for re-calculation were referenced back to part (B) to simplify the language and to include the exception regarding aggregate fault current.

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Public Input No. 2247-NFPA 70-2017 [Section No. 750.2]

750.2 Definitions.

~~For the purpose of this article, the following definitions shall apply.~~

~~**Control.**~~

~~The predetermined process of connecting, disconnecting, increasing, or reducing electric power.~~

(A) Application Within this Article and throughout the Code. The following definition shall apply within this article and throughout the code.

Energy Management System.

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

(B) Application Within this Article. The following definition shall apply only within this article.

Control.

The predetermined process of connecting, disconnecting, increasing, or reducing electric power.

Monitor.

An electrical or electronic means to observe, record, or detect the operation or condition of the electric power system or apparatus.

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

Related Public Inputs for This Document

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

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Public Input No. 4265-NFPA 70-2017 [New Definition after Definition: Energy Management System.]

Intelligent Coordinated Power Source.

A power source with integrated communications and control to which actively limits the current delivered on multiple circuits to multiple loads in a coordinated fashion to avoid potential overheating, manage energy consumption or avoid other fault conditions. An Intelligent Coordinated Power Source is a type of Energy Management System.

Informational Note: An example of an intelligent coordinated power source would be a multiple port power over Ethernet-enabled switch with communications and software enabled to utilize information obtained about the wiring connections and status, such as automated infrastructure management databases (with the gauge and bundling of wiring), requested and supplied current levels, and real-time sensing of the wiring configuration or temperature; to control current across the multiple circuits to avoid potential overheating,

Statement of Problem and Substantiation for Public Input

The continued evolution towards network-connected and intelligently controlled power sources allows improved safety and utility through the coordination of multiple power circuits. Article 750, Energy Management systems provides for systems which can both monitor, communicate and control the distribution of electric current to multiple circuits. Internet-of-things and Power-over-Ethernet systems have the ability to manage and coordinate power and safely avoid situations that may result in overheating when enabled with software control to be used as an intelligent coordinated power source. In these situations, the wiring ampacity restrictions of 725.144, which are based on all circuits being at full current delivery at the same time, are overly restrictive and unnecessary because the intelligent coordinated power power, as an energy management system, prevents such a case from occurring.

In addition to the use of this definition in a related PI, it is important to call attention that there are a large class of power sources (PoE devices) which are currently deployed and could qualify as a special type of Energy Managment System under the present definition.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 4264-NFPA 70-2017 [New Section after 750.30]	This PI uses the definition of intelligent controlled power source

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Public Input No. 4264-NFPA 70-2017 [New Section after 750.30]

750.40 Coordination of Power and Data.

The requirements of 725.144 shall not apply for an Intelligent Coordinated Power Source at current levels up to its rated current.

Statement of Problem and Substantiation for Public Input

The continued evolution towards network-connected and intelligently controlled power sources allows improved safety and utility through the coordination of multiple power circuits. Article 750, Energy Management systems provides for systems which can both monitor, communicate and control the distribution of electric current to multiple circuits. Internet-of-things and Power-over-Ethernet systems have the ability to manage and coordinate power and safely avoid situations that may result in overheating when enabled with software control to be used as an intelligent coordinated power source. In these situations, the wiring ampacity restrictions of 725.144, which are based on all circuits being at full current delivery at the same time, are overly restrictive and unnecessary because the intelligent coordinated power source, as an energy management system, prevents such a case from occurring.

Coordination of systems includes constant power sources supplying multi-port power capable of managing the power delivered across ports. This results in less than 100% utilization of bundles of cables at full current. Studies have shown that such practical installations have substantially lower temperature rise than shown in 725.144.

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Public Input No. 3299-NFPA 70-2017 [Section No. 750.30]

750.~~30~~ ~~Load~~ 30 Energy Management.

Energy management systems shall be permitted to monitor and control electrical loads, energy storage systems (ESS), and additional sources unless restricted in accordance with 750.30(A) through (C).

(A) Load Shedding Controls.

An energy management system shall not override the load shedding controls put in place to ensure the minimum electrical capacity for the following:

(1) Fire pumps

(2) Emergency systems

(3) Legally required standby systems

(4) Critical operations power systems

(B) Disconnection of Power.

An energy management system shall not be permitted to cause disconnection of power to the following:

(1) Elevators, escalators, moving walks, or stairway lift chairs

(2) Positive mechanical ventilation for hazardous (classified) locations

(3) Ventilation used to exhaust hazardous gas or reclassify an area

(4) Circuits supplying emergency lighting

(5) Essential electrical systems in health care facilities

(C) Capacity of Busbar, Branch Circuit, Feeder, or Service.

An energy management system shall not cause a busbar, branch circuit, feeder, or service to be overloaded at any time.

Where the sum of the load overcurrent protective device(s) connected to a busbar or feeder do not exceed the rating of the busbar or feeder and the sources are controlled by an energy management system, that busbar or feeder shall be permitted to have one or more energy sources with a sum of the individual ratings that exceed the rating of the busbar or feeder. The source connections shall be in accordance with 705.13.

Additional Proposed Changes

File Name	Description	Approved
PV_Industry_Forum.pdf		✓

Statement of Problem and Substantiation for Public Input

Multiple energy source situations are becoming more common and include systems employing several EV charging systems on a single circuit, energy storage systems (ESS) and various power production sources such as PV systems on a single circuit and various complex source configurations associated with ac and dc microgrids. The multiple sources may be variable in output such as PV and wind energy systems and when combined with an energy storage system could, when all outputs are maximized at the same time, result in an overloaded circuit that is being fed by of all of the multiple sources. The use of an energy management system that involves monitoring and control of all of the individual sources can prevent the feeder or busbar from being over loaded, while at the same time making most efficient use of the variable resources.

The requirement that the circuit or busbar supplied by multiple sources having an output overcurrent device rated the same as the circuit or busbar ensures that the circuit is protected if any control failure should occur in the energy management system.

Placing energy source management in the Energy Management Article 750 is already addressed by the definition of an Energy Management System in 750.2. A related proposal is being made in 705.13 because these interactive systems will be connected in accordance with the requirements of that section.

This PI was developed by the PV Industry Forum (PVIF).

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3292-NFPA 70-2017 [New Section after 705.12]	

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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:

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Jason Fisher, Tesla / SEIA (Vice Chair, Codes & Standards Working Group)
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Public Input No. 3407-NFPA 70-2017 [Annex F [Excluding any Sub-Sections]]

This informative annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

Informational Note: For information regarding power system reliability see IEEE 3006.5 Recommended Practice for the Use of Probability Methods for Conducting a Reliability Analysis of 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 IEEE 493 Design of Reliable Industrial and Commercial Power Systems -- the so-called "Gold Book", which is now being sunsetted and superseded by 3006.5.

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/3006.5-2014.html

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Public Input No. 3195-NFPA 70-2017 [Part II.]

Part II. Development and Implementation of Functional Performance Tests (FPTs) for Critical Operations Power Systems Development of FPT

(1) Submit Functional Performance Tests (FPTs). System/component tests or FPTs are developed from submitted drawings, systems operating documents (SODs), and systems operation and maintenance manuals (SOMMs), including large component testing (i.e., transformers, cable, generators, UPS), and how components operate as part of the total system. The commissioning authority develops the test and cannot be the installation contractor (or subcontractor).

As the equipment/components/systems are installed, quality assurance procedures are administered to verify that components are installed in accordance with minimum manufacturers' recommendations, safety codes, and acceptable installation practices. Quality assurance discrepancies are then identified and added to a “commissioning action list” that must be rectified as part of the commissioning program. These items would usually be discussed during commissioning meetings. Discrepancies are usually identified initially by visual inspection.

(2) Review FPTs. The tests must be reviewed by the customer, electrical contractors, quality assurance personnel, maintenance personnel, and other key personnel (the commissioning team). Areas of concern include, among others, all functions of the system being tested, all major components included, whether the tests reflect the system operating documents, and verification that the tests make sense.

(3) Make Changes to FPTs as Required. The commissioning authority then implements the corrections, questions answered, and additions.

(4) FPTs Approval. After the changes are made to the FPTs, they are submitted to the commissioning team. When it is acceptable, the customer or the designated approval authority approves the FPTs. It should be noted that even though the FPT is approved, problems that arise during the test (or areas not covered) must be addressed.

Testing Implementation for FPTs. The final step in the successful commissioning plan is testing and proper execution of system-integrated tests.

(1) Systems Ready to Operate. The FPTs can be implemented as various systems become operative (i.e., test for the generator system) or when the entire system is installed. However, the final “pull the plug” test is performed only after all systems are completely installed. If the electrical contractor (or subcontractor) implements the FPTs, a witness must initial each step of the test. The electrical contractor cannot employ the witness directly or indirectly.

(2) Perform Tests (FPTs). If the system fails the test, the problem must be resolved and the equipment or system retested or the testing requirements re-analyzed until successful tests are witnessed. Once the system or equipment passes testing, it is verified by designated commissioning official.

(3) Customer Receives System. After all tests are completed (including the “pull the plug” test), the system is turned over to the customer.

Informational Note: For information regarding reliability of critical operations power systems, see IEEE 3006.2 Recommended Practice for Evaluating the Reliability of Existing Industrial and Commercial Power Systems

Statement of Problem and Substantiation for Public Input

Quantitative approaches to maintaining the reliability of critical operations power systems requires special consideration in the later years of a protected facility life cycle. Nowhere in the built environment is continuity of power more essential than in critical operations power systems that support public safety.

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If accepted, I assume that the placement of this reference will be determined by style editors at the NFPA

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