

**Public Comment No. 2218-NFPA 70-2018 [ Global Input ]**

The Correlating Committee directs Panel 13 to review all references to Article 310 under their purview. Article 310 has been divided into Article 310,

Conductors for General Wiring, and Article 311, Medium Voltage Conductors and Cables for usability and clarity. Panel 13 shall appoint a task group

to review all necessary references to verify their accuracy and submit Public Comments where necessary. This action instructs Panel 13 to

submit a Public Comment(s) within the time frame required in the NEC schedule.

This action shall be considered as a public comment.

**Additional Proposed Changes**

| <u>File Name</u> | <u>Description Approved</u> |
|------------------|-----------------------------|
| CN_270.pdf       | CN_270                      |

**Statement of Problem and Substantiation for Public Comment**

NOTE: This Public Comment appeared as CC Note No. 270 in the First Draft Report.

The Correlating Committee directs Panel 13 to review all references to Article 310 under their purview. Article 310 has been divided into Article 310,

Conductors for General Wiring, and Article 311, Medium Voltage Conductors and Cables for usability and clarity. Panel 13 shall appoint a task group

to review all necessary references to verify their accuracy and submit Public Comments where necessary. This action instructs Panel 13 to

submit a Public Comment(s) within the time frame required in the NEC schedule.

This action shall be considered as a public comment.

**Related Item**

- Correlating Committee Note No. 270

**Submitter Information Verification**

**Submitter Full Name:** CC on NEC-AAC

**Organization:** NEC Correlating Committee

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Fri Sep 07 14:14:10 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected

**Resolution:** CMP-13 did not find any correlating issues and no action was taken.

**Correlating Committee Note No. 270-NFPA 70-2018 [ Global Input ]****Submitter Information Verification**

**Submitter Full Name:** Sarah Caldwell

**Committee:**

**Submittal Date:** Fri May 11 17:54:55 EDT 2018

**Committee Statement and Meeting Notes**

**Committee Statement:** The Correlating Committee directs all panels to review all references to Article 310 under their purview. Article 310 has been divided into Article 310, Conductors for General Wiring, and Article 311, Medium Voltage Conductors and Cables for usability and clarity. Each panel shall appoint a task group to review all necessary references to verify their accuracy and submit Public Comments where necessary. This action instructs the referenced panels to submit a Public Comment(s) within the time frame required in the NEC schedule.

This action shall be considered as a public comment.

**Ballot Results**

✔ This item has passed ballot

12 Eligible Voters

0 Not Returned

12 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

**Affirmative All**

Brunssen, James E.

Dressman, Kevin L.

Hickman, Palmer L.

Hittinger, David L.

Holub, Richard A.

Johnston, Michael J.

Kovacik, John R.

Manche, Alan

McDaniel, Roger D.

Pierce, James F.

Saporita, Vincent J.

Williams, David A.



## Public Comment No. 2235-NFPA 70-2018 [ Global Input ]

The Correlating Committee directs Panel 13 to review all Articles, within their purview, that supplement or modify (90.3) GFCI requirements in 210.8 for correlation, clarity, usability and standardized format. A Correlating Committee Task Group will be appointed and will submit comments where necessary.

This action shall be considered as a public comment.

### Additional Proposed Changes

| <u>File Name</u> | <u>Description Approved</u> |
|------------------|-----------------------------|
| CN_152.pdf       | CN_152                      |

### Statement of Problem and Substantiation for Public Comment

NOTE: This Public Comment appeared as CC Note No. 152 in the First Draft Report.

The Correlating Committee directs Panel 13 to review all Articles, within their purview, that supplement or modify (90.3) GFCI requirements in 210.8 for correlation, clarity, usability and standardized format. A Correlating Committee Task Group will be appointed and will submit comments where necessary.

This action shall be considered as a public comment.

#### Related Item

- Correlating Committee Note No. 152

### Submitter Information Verification

**Submitter Full Name:** CC on NEC-AAC  
**Organization:** NEC Correlating Committee  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Fri Sep 07 15:01:50 EDT 2018  
**Committee:** NEC-P13

### Committee Statement

**Committee Action:** Rejected  
**Resolution:** CMP 13 reviewed all references within our purview to 210.8 and no action was required.



## Correlating Committee Note No. 152-NFPA 70-2018 [ Global Input ]

### Submitter Information Verification

**Submitter Full Name:** Erik Hohengasser

**Committee:**

**Submittal Date:** Thu May 10 18:00:52 EDT 2018

### Committee Statement

**Committee Statement:** The Correlating Committee directs each panel to review all Articles, within their purview, that supplement or modify (90.3) GFCI requirements in 210.8 for correlation, clarity, usability and standardized format. A Correlating Committee Task Group will be appointed and will submit comments where necessary.

This action shall be considered as a public comment.

### Ballot Results

✔ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

12 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

#### Affirmative All

Brunssen, James E.

Dressman, Kevin L.

Hickman, Palmer L.

Hittinger, David L.

Holub, Richard A.

Johnston, Michael J.

Kovacik, John R.

Manche, Alan

McDaniel, Roger D.

Pierce, James F.

Saporita, Vincent J.

Williams, David A.



## Public Comment No. 831-NFPA 70-2018 [ Global Input ]

The Correlating Committee directs that the panel revise the text in the Informational Note for clarity and sentence structure.

This action will be considered as a public comment.

### Additional Proposed Changes

| <u>File Name</u>    | <u>Description Approved</u> |
|---------------------|-----------------------------|
| CN_203_-_Global.pdf | 70_CN 203                   |

### Statement of Problem and Substantiation for Public Comment

NOTE: This Public Comment appeared as CC Note No. 203 in the First Draft Report on First Revision No. 8979.

The Correlating Committee directs that the panel revise the text in the Informational Note for clarity and sentence structure.

This action will be considered as a public comment.

#### Related Item

- FR 8979

### Submitter Information Verification

**Submitter Full Name:** CC on NEC-AAC

**Organization:** NEC Correlating Committee

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Mon Aug 20 10:30:25 EDT 2018

**Committee:** NEC-P13

### Committee Statement

**Committee Action:** Rejected

**Resolution:** The intent of this comment was met editorially in the First Draft stage.



## Correlating Committee Note No. 203-NFPA 70-2018 [ Global Input ]

### Submitter Information Verification

**Submitter Full Name:** Erik Hohengasser

**Committee:**

**Submittal Date:** Fri May 11 12:23:26 EDT 2018

### Committee Statement

**Committee Statement:** The Correlating Committee directs that the panel revise the text in the Informational Note for clarity and sentence structure.

This action will be considered as a public comment.

First Revision No. 8979-NFPA 70-2018 [Global Input]

### Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

12 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

#### Affirmative All

Brunssen, James E.

Dressman, Kevin L.

Hickman, Palmer L.

Hittinger, David L.

Holub, Richard A.

Johnston, Michael J.

Kovacik, John R.

Manche, Alan

McDaniel, Roger D.

Pierce, James F.

Saporita, Vincent J.

Williams, David A.

**Public Comment No. 833-NFPA 70-2018 [ Global Input ]**

The Correlating Committee directs CMP-4 and CMP-13 to correlate inconsistent duplicate definitions as seen in FR-9008, FR-8983, and FR-8984.

The Correlating Committee advises that CMP-13 has purview over these definitions.

This action will be considered as a public comment.

**Additional Proposed Changes**

| <u>File Name</u>    | <u>Description Approved</u> |
|---------------------|-----------------------------|
| CN_206_-_Global.pdf | 70_ CN 206                  |

**Statement of Problem and Substantiation for Public Comment**

NOTE: This Public Comment appeared as CC Note No. 206 in the First Draft Report on First Revision No. 9008.

The Correlating Committee directs CMP-4 and CMP-13 to correlate inconsistent duplicate definitions as seen in FR-9008, FR-8983, and FR-8984.

The Correlating Committee advises that CMP-13 has purview over these definitions.

This action will be considered as a public comment.

**Related Item**

- FR 9008

**Submitter Information Verification**

**Submitter Full Name:** CC on NEC-AAC

**Organization:** NEC Correlating Committee

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Mon Aug 20 10:52:37 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected

**Resolution:** CMP 13 addressed the two definitions in Article 100 in second revisions 7564 and 7567.



## Correlating Committee Note No. 206-NFPA 70-2018 [ Global Input ]

### Submitter Information Verification

**Submitter Full Name:** Erik Hohengasser

**Committee:**

**Submittal Date:** Fri May 11 12:54:51 EDT 2018

### Committee Statement

**Committee Statement:** The Correlating Committee directs CMP-4 and CMP-13 to correlate inconsistent duplicate definitions as seen in FR-9008, FR-8983, and FR-8984.

The Correlating Committee advises that CMP-13 has purview over these definitions.

This action will be considered as a public comment.

First Revision No. 9008-NFPA 70-2018 [Global Input]

### Ballot Results

✓ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

12 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

#### **Affirmative All**

Brunssen, James E.

Dressman, Kevin L.

Hickman, Palmer L.

Hittinger, David L.

Holub, Richard A.

Johnston, Michael J.

Kovacik, John R.

Manche, Alan

McDaniel, Roger D.

Pierce, James F.

Saporita, Vincent J.

Williams, David A.



## Public Comment No. 1958-NFPA 70-2018 [ Definition: Interactive Inverter. ]

### Interactive Inverter.

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

### Statement of Problem and Substantiation for Public Comment

We support the added phrase to the definition, but are of the opinion that the existing phrase "that may deliver power to the utility" should not have been deleted from the definition. The committee statement acknowledges that interactive inverters may indeed deliver power to the utility, so there is no functional change. Removing the phrase however may suggest otherwise to users/AHJs.

#### Related Item

- FR-7750

### Submitter Information Verification

**Submitter Full Name:** Jason Fisher

**Organization:** Tesla Inc.

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Thu Aug 30 13:04:53 EDT 2018

**Committee:** NEC-P13

### Committee Statement

**Committee Action:** Rejected but see related SR

**Resolution:** [SR-7545-NFPA 70-2018](#)

**Statement:** This revision is editorial, and reinserts text deleted in the first draft stage with editorial modifications for clarity.

**Public Comment No. 1204-NFPA 70-2018 [ Definition: Inverter Input Circuit. ]****Inverter Input Circuit.**

Conductors between the inverter and the ESS in stand-alone and multimode inverter systems.

**Additional Proposed Changes**

| <u>File Name</u> | <u>Description Approved</u> |
|------------------|-----------------------------|
| CN_207.pdf       | 70_CN 207                   |

**Statement of Problem and Substantiation for Public Comment**

NOTE: This Public Comment appeared as CC Note No. 207 in the First Draft Report on First Revision No. 8983, 9008, 8984.

The Correlating Committee directs CMP-4 and CMP-13 to correlate inconsistent duplicate definitions as seen in FR-9008, FR-8983, and FR-8984.

The Correlating Committee advises that CMP-13 has purview over these definitions.

This action will be considered as a public comment.

**Related Item**

• FR 9008 • FR 8983 • FR 8984

**Submitter Information Verification**

**Submitter Full Name:** CC on NEC-AAC

**Organization:** NEC Correlating Committee

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Fri Aug 24 12:01:32 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7564-NFPA 70-2018

**Statement:** This action removes duplicate definitions, and retains the general use description of the term. This definition is in alignment with the defined term "inverter."

**Correlating Committee Note No. 207-NFPA 70-2018 [ Definition: Inverter Input Circuit. ]****Submitter Information Verification**

**Submitter Full Name:** Erik Hohengasser

**Committee:**

**Submittal Date:** Fri May 11 12:58:28 EDT 2018

**Committee Statement and Meeting Notes**

**Committee Statement:** The Correlating Committee directs CMP-4 and CMP-13 to correlate inconsistent duplicate definitions as seen in FR-9008, FR-8983, and FR-8984.

The Correlating Committee advises that CMP-13 has purview over these definitions.

This action will be considered as a public comment.

[First Revision No. 8983-NFPA 70-2018 \[Definition: Inverter Input Circuit.\]](#)

**Ballot Results**

✔ This item has passed ballot

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

**Affirmative All**

Brunssen, James E.  
Dressman, Kevin L.  
Hickman, Palmer L.  
Hittinger, David L.  
Holub, Richard A.  
Johnston, Michael J.  
Kovacik, John R.  
Manche, Alan  
McDaniel, Roger D.  
Pierce, James F.  
Saporita, Vincent J.  
Williams, David A.

**Public Comment No. 1205-NFPA 70-2018 [ Definition: Inverter Input Circuit. ]****Inverter Input Circuit.**

Conductors between the inverter and the ESS in stand-alone and multimode inverter systems.

**Additional Proposed Changes**

| <u>File Name</u> | <u>Description Approved</u> |
|------------------|-----------------------------|
| CN_207.pdf       | 70_CN 207                   |

**Statement of Problem and Substantiation for Public Comment**

NOTE: This Public Comment appeared as CC Note No. 207 in the First Draft Report on First Revision Nos. 9008, 8983 & 8984.

The Correlating Committee directs CMP-4 and CMP-13 to correlate inconsistent duplicate definitions as seen in FR-9008, FR-8983, and FR-8984.

The Correlating Committee advises that CMP-13 has purview over these definitions.

This action will be considered as a public comment.

**Related Item**

• FR 9008 • FR 8983 • FR 8984

**Submitter Information Verification**

**Submitter Full Name:** CC on NEC-AAC

**Organization:** NEC Correlating Committee

**Street Address:**

**City:**

**State:**

**Zip:**

**Submission Date:** Fri Aug 24 12:04:15 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7564-NFPA 70-2018

**Statement:** This action removes duplicate definitions, and retains the general use description of the term. This definition is in alignment with the defined term "inverter."

**Correlating Committee Note No. 207-NFPA 70-2018 [ Definition: Inverter Input Circuit. ]****Submitter Information Verification**

**Submitter Full Name:** Erik Hohengasser

**Committee:**

**Submittal Date:** Fri May 11 12:58:28 EDT 2018

**Committee Statement and Meeting Notes**

**Committee Statement:** The Correlating Committee directs CMP-4 and CMP-13 to correlate inconsistent duplicate definitions as seen in FR-9008, FR-8983, and FR-8984.

The Correlating Committee advises that CMP-13 has purview over these definitions.

This action will be considered as a public comment.

[First Revision No. 8983-NFPA 70-2018 \[Definition: Inverter Input Circuit.\]](#)

**Ballot Results**

✔ This item has passed ballot

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

**Affirmative All**

Brunssen, James E.  
Dressman, Kevin L.  
Hickman, Palmer L.  
Hittinger, David L.  
Holub, Richard A.  
Johnston, Michael J.  
Kovacik, John R.  
Manche, Alan  
McDaniel, Roger D.  
Pierce, James F.  
Saporita, Vincent J.  
Williams, David A.

**Public Comment No. 1210-NFPA 70-2018 [ 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.

**Additional Proposed Changes**

| <u>File Name</u> | <u>Description Approved</u> |
|------------------|-----------------------------|
| CN_208.pdf       | 70_CN 208                   |

**Statement of Problem and Substantiation for Public Comment**

NOTE: This Public Comment appeared as CC Note No. 208 in the First Draft Report on First Revision No. 9008, 8983 & 8984.

The Correlating Committee directs CMP-4 and CMP-13 to correlate inconsistent duplicate definitions as seen in FR-9008, FR-8983, and FR-8984.

The Correlating Committee advises that CMP-13 has purview over these definitions.

This action will be considered as a public comment.

**Related Item**

• FR 9008 • FR 8983 • FR 8984

**Submitter Information Verification**

**Submitter Full Name:** CC on NEC-AAC

**Organization:** NEC Correlating Committee

**Street Address:**

**City:**

**State:**

**Zip:**

**Submission Date:** Fri Aug 24 13:00:45 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7567-NFPA 70-2018

**Statement:** This revision removes duplicate definitions and retains the general use description of the term. This is in alignment with the definition of "inverter."

**Correlating Committee Note No. 208-NFPA 70-2018 [ Definition: Inverter Output Circuit. ]****Submitter Information Verification**

**Submitter Full Name:** Erik Hohengasser

**Committee:**

**Submittal Date:** Fri May 11 12:59:24 EDT 2018

**Committee Statement and Meeting Notes**

**Committee Statement:** The Correlating Committee directs CMP-4 and CMP-13 to correlate inconsistent duplicate definitions as seen in FR-9008, FR-8983, and FR-8984.

The Correlating Committee advises that CMP-13 has purview over these definitions.

This action will be considered as a public comment.

[First Revision No. 8984-NFPA 70-2018 \[Definition: Inverter Output Circuit.\]](#)

**Ballot Results**

✔ **This item has passed ballot**

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

**Affirmative All**

Brunssen, James E.  
Dressman, Kevin L.  
Hickman, Palmer L.  
Hittinger, David L.  
Holub, Richard A.  
Johnston, Michael J.  
Kovacik, John R.  
Manche, Alan  
McDaniel, Roger D.  
Pierce, James F.  
Saporita, Vincent J.  
Williams, David A.

**Public Comment No. 1211-NFPA 70-2018 [ 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.

**Additional Proposed Changes**

| <u>File Name</u> | <u>Description Approved</u> |
|------------------|-----------------------------|
| CN_208.pdf       | 70_CN 208                   |

**Statement of Problem and Substantiation for Public Comment**

NOTE: This Public Comment appeared as CC Note No. 208 in the First Draft Report on First Revision Nos. 9008, 8983 & 8984.

The Correlating Committee directs CMP-4 and CMP-13 to correlate inconsistent duplicate definitions as seen in FR-9008, FR-8983, and FR-8984.

The Correlating Committee advises that CMP-13 has purview over these definitions.

This action will be considered as a public comment.

**Related Item**

• FR 9008 • FR 8983 • FR 8984

**Submitter Information Verification**

**Submitter Full Name:** CC on NEC-AAC

**Organization:** NEC Correlating Committee

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Fri Aug 24 13:04:18 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** [SR-7567-NFPA 70-2018](#)

**Statement:** This revision removes duplicate definitions and retains the general use description of the term. This is in alignment with the definition of "inverter."

**Correlating Committee Note No. 208-NFPA 70-2018 [ Definition: Inverter Output Circuit. ]****Submitter Information Verification**

**Submitter Full Name:** Erik Hohengasser

**Committee:**

**Submittal Date:** Fri May 11 12:59:24 EDT 2018

**Committee Statement and Meeting Notes**

**Committee Statement:** The Correlating Committee directs CMP-4 and CMP-13 to correlate inconsistent duplicate definitions as seen in FR-9008, FR-8983, and FR-8984.

The Correlating Committee advises that CMP-13 has purview over these definitions.

This action will be considered as a public comment.

[First Revision No. 8984-NFPA 70-2018 \[Definition: Inverter Output Circuit.\]](#)

**Ballot Results**

✔ This item has passed ballot

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

**Affirmative All**

Brunssen, James E.  
Dressman, Kevin L.  
Hickman, Palmer L.  
Hittinger, David L.  
Holub, Richard A.  
Johnston, Michael J.  
Kovacik, John R.  
Manche, Alan  
McDaniel, Roger D.  
Pierce, James F.  
Saporita, Vincent J.  
Williams, David A.

**Public Comment No. 2007-NFPA 70-2018 [ Definition: Prime Mover. ]****Prime Mover.**

The machine that supplies the mechanical horsepower ~~of~~ for a generator. (CMP-13)

**Statement of Problem and Substantiation for Public Comment**

The wording in the definition does not provide clarity. A generator set would include the prime mover and generator. Alternatively the word "to" could be use if preferred.

**Related Item**

- FR 7886

**Submitter Information Verification**

**Submitter Full Name:** Paul Dobrowsky

**Organization:** Innovative Technology Services

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Thu Aug 30 14:38:24 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** [SR-7549-NFPA 70-2018](#)

**Statement:** The definition of "prime mover" was editorially revised to replace "for" with "to" for clarity.



## Public Comment No. 1110-NFPA 70-2018 [ Definition: Switch, Bypass Isolation. ]

### Switch, Bypass Isolation.

An A manual, automatic or a nonautomatic device used in conjunction with a transfer switch to provide a means of directly connecting load conductors to a power source and of disconnecting the transfer switch. (CMP-13)

### Statement of Problem and Substantiation for Public Comment

Daniel Neeser is correct, manual bypass isolation switches exist, just usually in smaller ratings. There is no reason to exclude them by omission.

#### Related Item

- First Revision No. 8981-NFPA 70-2018

### Submitter Information Verification

**Submitter Full Name:** MARVIN HAMON

**Organization:** HAMON ENGINEERING INC

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Wed Aug 22 18:48:19 EDT 2018

**Committee:** NEC-P13

### Committee Statement

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7635-NFPA 70-2018

**Statement:** There are three potential types of bypass isolation switches – manual, non-automatic and automatic. Per UL 1008, manual operation is non-electrically operated. Non-automatic is electrically operated and not self-acting. An automatic switch is self-acting. This second revision corrects the definition, “manual” needs to remain in the definition.



## Public Comment No. 619-NFPA 70-2018 [ Definition: Switch, Bypass Isolation. ]

### Switch, Bypass Isolation.

~~An automatic or a nonautomatic-~~ A manual, nonautomatic, or automatic operated device used in conjunction with a transfer switch to provide a means of directly connecting load conductors to a power source and of disconnecting the transfer switch. (CMP-13)

### Statement of Problem and Substantiation for Public Comment

There are three potential types of bypass isolation switches – manual, non-automatic and automatic. Per UL 1008, manual operation is non-electrically operated. Non-automatic is electrically operated and not self-acting. An automatic switch is self-acting. To correct the definition, “manual” needs to remain in the definition. This proposed revision corrects the definition.

#### Related Item

- FR8981

### Submitter Information Verification

**Submitter Full Name:** Daniel Neeser

**Organization:** Eaton's Bussmann Division

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Tue Aug 14 10:11:19 EDT 2018

**Committee:** NEC-P13

### Committee Statement

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7635-NFPA 70-2018

**Statement:** There are three potential types of bypass isolation switches – manual, non-automatic and automatic. Per UL 1008, manual operation is non-electrically operated. Non-automatic is electrically operated and not self-acting. An automatic switch is self-acting. This second revision corrects the definition, “manual” needs to remain in the definition.



## Public Comment No. 1108-NFPA 70-2018 [ Definitions (100): Inverter In... to Inverter In... ]

**Definitions (100): Inverter In... to Inverter In...**

**Inverter Input Circuit.**

Conductors

~~between the inverter and the ESS in stand-alone and multimode inverter systems.~~

**Inverter Input Circuit.**

Conductors

connected to the dc input of an inverter. (CMP-4)

### Statement of Problem and Substantiation for Public Comment

There are two definitions for Inverter Input Circuit that look like they were move to 100 from different code sections. I recommend deleting the more specific one.

**Related Item**

- Public Input No. 4255-NFPA 70-2017

### Submitter Information Verification

**Submitter Full Name:** MARVIN HAMON

**Organization:** HAMON ENGINEERING INC

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Wed Aug 22 18:40:40 EDT 2018

**Committee:** NEC-P13

### Committee Statement

**Committee Action:** Rejected but see related SR

**Resolution:** [SR-7564-NFPA 70-2018](#)

**Statement:** This action removes duplicate definitions, and retains the general use description of the term. This definition is in alignment with the defined term "inverter."

**Public Comment No. 1845-NFPA 70-2018 [ Definitions (100): Inverter In... to Inverter Ou... ]****Definitions (100): Inverter In... to Inverter Ou...****Inverter Input Circuit.**

Conductors between the inverter and the ESS in stand-alone and multimode inverter systems.

**Inverter**

Input Circuit.

~~Conductors connected to the dc input of an inverter. (CMP-4)~~

~~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 Output Circuit.**

~~Conductors connected to the ac output of an inverter. (CMP-4)~~

**Statement of Problem and Substantiation for Public Comment**

There are two definitions for both of these terms published in the First Draft. Panel 13 asked to move their definition to Article 100 but there is already a definition in Article 100 under the control of CMP 4. This action from the First Revision needs to be correlated with the existing text in Article 100. I "presume" that the panel wanted to replace the current definitions and move the control of the definitions from CMP4 to CMP13, but if not, then they should select an alternate term so there is no confusion between these definitions and their usage throughout the code.

**Related Item**

- FR-9008

**Submitter Information Verification**

**Submitter Full Name:** Richard Holub

**Organization:** The DuPont Company, Inc.

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Thu Aug 30 09:58:34 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee** Rejected but see related SR

**Action:**

**Resolution:** [SR-7564-NFPA 70-2018](#)

**Statement:** This action removes duplicate definitions, and retains the general use description of the term. This definition is in alignment with the defined term "inverter."



## Public Comment No. 1109-NFPA 70-2018 [ Definitions (100): Inverter Ou... to Inverter Ou... ]

### Definitions (100): Inverter Ou... to Inverter Ou...

#### 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 Output Circuit.

##### Conductors

connected to the ac output of an inverter. (CMP-4)

### Statement of Problem and Substantiation for Public Comment

There are two definitions for Inverter Output Circuit that look like they were move to 100 from different code sections. I recommend deleting the more specific one.

#### Related Item

- Public Input No. 4262-NFPA 70-2017

### Submitter Information Verification

**Submitter Full Name:** MARVIN HAMON

**Organization:** HAMON ENGINEERING INC

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Wed Aug 22 18:43:37 EDT 2018

**Committee:** NEC-P13

### Committee Statement

**Committee Action:** Rejected but see related SR

**Resolution:** [SR-7567-NFPA 70-2018](#)

**Statement:** This revision removes duplicate definitions and retains the general use description of the term. This is in alignment with the definition of "inverter."

**Public Comment No. 5-NFPA 70-2018 [ New Section after 445.1 ]****445.6 Listing Requirements.**

Generators shall be listed and labeled for the conditions of use for each of the following:

(1) Permanently installed generators operating at 600 volts nominal or less.

(2) Portable generators rated at 15 kW and less, vehicle, and trailer mounted generators operating in accordance with 590.3(A)

*Exception to (2): Portable, vehicle, and trailer mounted generators shall not be required to be listed where approved by the authority having jurisdiction.*

**Additional Proposed Changes**

| <u>File Name</u>                      | <u>Description</u>           | <u>Approved</u> |
|---------------------------------------|------------------------------|-----------------|
| OSHA_Standard_Interpretation_1_2_.pdf | OSHA Standard Interpretation |                 |
| OSHA_Standard_Interpretation_2_2_.pdf | OSHA Standard Interpretation |                 |
| OSHA_Standard_Interpretation_3_2_.pdf | OSHA Standard Interpretation |                 |

**Statement of Problem and Substantiation for Public Comment**

The 2018 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.

Additionally, the 2018 ICC International Building Code in Section 2702.1.1 requires all emergency and legally required standby generators to be 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.

OSHA has provided Standard Interpretations that portable, vehicle, and trailer mounted generators providing temporary power to a construction site are required to be approved and listed by an OSHA Nationally Recognized Testing Laboratory, or approved by the AHJ. The proposed exception provides relief and permits the AHJ to approve an unlisted portable or vehicle mounted generator.

The Public Comment adds clarity to resolved PI-12 by narrowing the focus for which types of generators should be listed and labeled which was a concern of the task group and code making panel. The UL 2200 Standard for Safety, Stationary Engine Generator Assemblies, limits the scope of the standard to generators operating at 600V nominal or less. The ANSI/PGMA G300-2015 Safety and Performance of Portable Generators is a consensus ANSI product standard written by the Portable Generator Manufacturers Association and applies to portable generators rated 15 kW and less.

**Related Public Comments for This Document**

| <u>Related Comment</u>                       | <u>Relationship</u> |
|----------------------------------------------|---------------------|
| Public Comment No. 83-NFPA 70-2018 [Annex A] |                     |
| <u>Related Item</u>                          |                     |
| • PI-12 NFPA 70-2017                         |                     |

**Submitter Information Verification**

**Submitter Full Name:** Brian Baughman  
**Organization:** Generac Power Systems Inc  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Mon Jun 25 14:22:18 EDT 2018  
**Committee:** NEC-P13

**Committee Statement**

**Committee** Rejected but see related SR

**Action:**

**Resolution:** [SR-7639-NFPA 70-2018](#)

**Statement:** The addition of a stationary generator listing requirement in 445.6 will address safety concerns for both the electric and fuel control for stationary generators that are rated 600 volts and below.

CMP 13 requests that the NEC Correlating Committee review the new exception and form a task group to explore a requirement in Article 110 to globally address field labeling where the NEC requires a listed product.

Standard Interpretations (/laws-regs/standardinterpretations/publicationdate)

/ Safety of employees in the workplace where portable generators are used as power sources.

1910.302 ([https://www.osha.gov/pls/oshaweb/owalink.query\\_links?](https://www.osha.gov/pls/oshaweb/owalink.query_links?src_doc_type=STANDARDS&src_unique_file=0&src_anchor_name=1910.302)

- **Standard Number:** src\_doc\_type=STANDARDS&src\_unique\_file=0&src\_anchor\_name=1910.302)

OSHA requirements are set by statute, standards and regulations. Our interpretation letters explain these requirements and how they apply to particular circumstances, but they cannot create additional employer obligations. This letter constitutes OSHA's interpretation of the requirements discussed. Note that our enforcement guidance may be affected by changes to OSHA rules. Also, from time to time we update our guidance in response to new information. To keep apprised of such developments, you can consult OSHA's website at <http://www.osha.gov> (/).

November 5, 1991

Mr. Lawrence R. Roche  
Senior Project Engineer  
WINCO, Inc.  
225 South Carolina Avenue  
Le Center, Minnesota 56057

Dear Mr. Roche:

This is in response to your letter of July 16 requesting written clarification regarding the safety of employees in the workplace where portable generators are used as power sources in separately derived systems. Thank you for follow-up information forwarded by your letter of August 9. The three questions you asked and the corresponding replies follow. Please accept our apology for the delay in response.

**Question 1:** "Is bonding the neutral of a portable

generator to the general frame optional?"

**Reply:** a. If a portable generator is to be used as an electrical power source in a separately derived system, as opposed to a service supplied system such as is installed permanently in a building, a neutral (ground) conductor **must** be bonded to the portable generator frame; it is not optional.

b. Given a. above, the frame of a portable generator is not required to be grounded when supplying electricity to equipment mounted on the generator if the noncurrent carrying metal parts of the equipment are bonded to the generator frame.

- c. Given a. and b. above, the frame of a portable generator is not required to be grounded when supplying electricity to equipment through receptacles mounted on the generator by way of directly-connected or plug-connected conductor cables if the grounding conductor terminals of the receptacles are bonded to the generator frame. Grounding continuity from equipment through the conductor cable to the receptacle is required.
- d. A separately derived system ceases to exist when the neutral of its portable generator (or other alternating current (AC) power source) is interconnected to the neutral of a service-supplied system.
- e. For grounding of portable generators supplying fixed wiring systems reference is made to the National Electrical Code (NEC), section 250-5(d).

**Question 2:** "If the portable generator as defined by

NEC Section 250-6(a)(i) and (2) is a three wire 120/240 volt unit, is bonding of the neutral to the generator frame still optional?"

**Reply:** The preceding response to question 1 also applies to three wired 120/240 volt portable generators used as electrical power sources in separately derived systems.

**Question 3:** "Does NEC Section 250-6(c), describing

neutral bonding of a separately derived system apply even to portable generators as defined above?"

**Reply:** Yes, Section 250-6(c), as clarified by the reply to question number 1, applies to three wire 120/240 volt portable generators used as electrical power sources in separately derived systems.

We appreciate your interest in employee safety and health. If we can be of further assistance, please do not hesitate to contact us.

Sincerely,

Patricia K. Clark, Director  
Directorate of Compliance Programs

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Standard Interpretations (/laws-regs/standardinterpretations/publicationdate)

/ Approval of Portable Generators by a qualified testing laboratory.

- **Standard Number:** 1926.403 ([https://www.osha.gov/pls/oshaweb/owalink.query\\_links?src\\_doc\\_type=STANDARDS&src\\_unique\\_file=0&src\\_anchor\\_name=1926.403](https://www.osha.gov/pls/oshaweb/owalink.query_links?src_doc_type=STANDARDS&src_unique_file=0&src_anchor_name=1926.403));  
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October 1, 1991

Mr. Colin Iwasa  
OPE Product Coordinator  
Yamaha Motor Corporation  
6555 Katella Avenue  
Cypress, California 90630

Dear Mr. Iwasa:

This is in response to your August 14, 1991, letter requesting clarification of the Occupational Safety and Health Administration's (OSHA) electrical standards pertaining to portable generators.

In regard to your question whether portable or vehicle mounted generators on a job site are required to be listed, labeled or certified, please be advised that OSHA has no such requirement. However, paragraph (a) of 29 CFR 1926.403 requires all electrical conductors and equipment to be "approved". OSHA has determined that equipment listed, labeled, or certified to be safe by a qualified testing laboratory, is considered to be "approved". (A copy of 29 CFR 1926, Subpart K is enclosed. Please see the definitions of "acceptable" and "approved".)

In regard to your question whether a 120/240 volt portable generator rated at 5000 watts is required to have the neutrals bonded, please be advised as follows: A neutral conductor shall be bonded to the generator frame when the generator is a component of a separately derived system. (See 29 CFR 1926.404(f)(3)(iii)). Thus, where the generator supplies only equipment mounted on the generator and/or cord- and plug-connected equipment through receptacles mounted on the generator and the noncurrent-carrying metal parts of equipment and equipment grounding conductor terminals of the receptacles are bonded to the generator frame, then the portable generator frame is not required to be grounded and is permitted to serve as the grounding electrode. (See 29 CFR, 1926.404(f)(3)(i)). However, portable generators supplying fixed wiring systems are not generally considered to be separately derived systems and usually have to be grounded. An alternating-current power source such as an on-site generator is not a separately derived system if the neutral is solidly interconnected to a service-supplied system neutral. In such cases, the neutral conductor of a single-phase, 3 wire system must be grounded. (See 29 CFR 1926.404(f)(1), (4), and (5)).

If we can be of further assistance, please contact Mr. Roy Gurnham, Director, Office of Construction and Maritime Compliance Assistance, phone (202) 523-8136.

Sincerely,

Patricia K. Clark, Director  
Directorate of Compliance Programs

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Standard Interpretations (/laws-regs/standardinterpretations/publicationdate)  
/ Portable and vehicle mounted generators must be "approved" on the job site.

- **Standard Number:** 1926.403 ([https://www.osha.gov/pls/oshaweb/owalink.query\\_links?src\\_doc\\_type=STANDARDS&src\\_unique\\_file=0&src\\_anchor\\_name=1926.403](https://www.osha.gov/pls/oshaweb/owalink.query_links?src_doc_type=STANDARDS&src_unique_file=0&src_anchor_name=1926.403));  
1926.449 ([https://www.osha.gov/pls/oshaweb/owalink.query\\_links?src\\_doc\\_type=STANDARDS&src\\_unique\\_file=0&src\\_anchor\\_name=1926.449](https://www.osha.gov/pls/oshaweb/owalink.query_links?src_doc_type=STANDARDS&src_unique_file=0&src_anchor_name=1926.449))

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June 28, 1993

Mr. Colin Iwasa  
Yamaha Power Equipment  
6555 Katella Avenue  
Cypress, California 90630

Dear Mr. Iwasa:

This is in response to your December 20, 1991, letter requesting clarification of Occupational Safety and Health Administration (OSHA) standards concerning portable and vehicle mounted generators. I apologize for the excessive delay in responding to your inquiry.

In regard to whether portable and vehicle mounted generators on a construction job site are required to be listed, labeled or certified, please be advised that all electrical conductors and equipment are required to be "approved," according to 1926.403(a). Section 1926.449 includes definitions of terms used in the Electrical Standards for Construction, contained in Subpart K of 29 CFR Part 1926. The definitions of "approved" and "acceptable" indicate what constitutes approval under Subpart K of the Construction Standards.

An installation or equipment is acceptable to the Assistant Secretary of Labor, and approved within the meaning of this Subpart K:

- (a) If it is accepted, or certified, or listed, or labeled, or otherwise determined to be safe by a qualified testing laboratory capable of determining the suitability of materials and equipment for installation and use in accordance with this standard; or
- (b) With respect to an installation or equipment of a kind which no qualified testing laboratory accepts, certifies, lists, labels, or determines to be safe, if it is inspected or tested by another Federal agency, or by a State, municipal or other local authority responsible for enforcing occupational safety provisions of the National Electrical Code, and found in compliance with those provisions; or
- (c) With respect to custom-made equipment or related installations which are designated, fabricated for, and intended for use by a particular customer, if it is determined to be safe for its intended use by its manufacturer on the basis of test data which the employer keeps and makes available for inspection to the Assistant Secretary and

his authorized representatives.

Electric equipment (i.e., generators) meeting (a), (b) or (c) above will be considered approved by OSHA.

In regard to whether portable and vehicle mounted generators are included in the definition of "equipment" for purposes of Subpart K, please be advised that "equipment" is defined as follows:

A general term including material, fittings, devices, appliances, fixtures, apparatus, and the like, used as a part of, or in connections with, an electrical installation.

This definition clearly includes an electric generator supplying power to other electric equipment used on a jobsite.

In regard to a separately derived system, please be advised that the National Electrical Code (National Fire Protection Association, NFPA 70) contains information useful in determining whether a portable or vehicle-mounted electric generator is being used as part of a separately derived system. Section 250-5(d) of this code contains the following explanation:

**(d) Separately Derived Systems.** A premises wiring system whose power is derived from generator, transformer, or converter windings and has no direct electrical connection, including a solidly connected grounded circuit conductor, to supply conductors originating in another system...

(FPN No. 1): An alternate alternating-current power source such as an on-site generator is not a separately derived system if the neutral is solidly interconnected to a service-supplied system neutral.

Thus, a separately derived system has **no** direct electrical connection to another system supplying power at the jobsite, while a non-separately derived system would be directly connected to another system supplying power to the site. A non-separately derived system at the jobsite would not need to have its neutral grounded, because the service-supplied system would already provide this function. Portable and vehicle-mounted generators are typically used to provide primary power for utilization equipment on construction sites and are normally separately derived systems for the purposes of OSHA's electrical standards for construction.

In the OSHA standards for portable vehicle-mounted generators, equipment grounding conductor bonding is mentioned in 1926.404(f)(3)(i)(B) and in 1926.404(f)(3)(ii)(C). Neutral conductor bonding is mentioned in 1926.404(f)(3)(iii).

The intent of 1926.404(f)(3)(iii) becomes very clear when one considers that the term "neutral" is used in its technical sense. A 120/240 volt system has a neutral and therefore must be bonded to the generator frame. A 2-wire 120 volt system has no neutral and therefore bonding is optional. Recall that neither side of a 2-wire derived system is a neutral and when one grounds either side, it becomes a grounded terminal or conductor, but it is not a neutral.

If we can be of any further assistance, please contact me or Mr. Dale R. Cavanaugh of my staff in the Office of Construction and Maritime Compliance Assistance at (202) 219-8136.

Sincerely,

Roy F. Gurnham, P.E., Esq. Director  
Office of Construction and Maritime  
Compliance Assistance

December 20, 1991

Patricia K. Clark  
Directorate of Compliance Programs  
U.S. Department of Labor  
Washington, D.C. 20210

Dear Ms. Clark:

Your letter of October 1, 1991 pertaining to portable and vehicle mounted generators left me somewhat less than clear on OSHA's standards.

The following is my understanding of the information which you provided.

**Labeled, listed, certified.**

Portable and vehicle mounted generators on a job sit are not required to be listed, labeled or certified.

As defined in subpart K, portable and vehicle mounted generators are not "electrical conductors" or "equipment".

**Neutral Bonding**

Neutral bonding is required when the generator is a component of a separately derived system (29 CFR 1926.404(f)(3)(iii)).

A generator is not a component of a separately derived system when it only supplies equipment mounted on the generator and/or cord and plug connected equipment through the generator receptacles.

A generator is a component of a separately derived system when it supplies conductors originating in another system.

29 CFR 1926.404(f)(3)(i) does not refer to neutral bonding.

29 CFR 1926.404(f)(1), (4) and, (5) do not refer to neutral bonding.

If my understanding of your letter is incorrect, inaccurate or incomplete please contact me.

Sincerely,

Colin Iwasa  
Outdoor Power Equipment

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**Public Comment No. 1834-NFPA 70-2018 [ New Section after 445.10 ]****TITLE OF NEW CONTENT**

Type your content here ... **445.6 Listing Requirements.** Generators rated 600 V or less shall be listed.

**Statement of Problem and Substantiation for Public Comment**

Substantiation – I have revised my proposal to address the concerns raised in the resolution statement.

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. These generators include single phase and three phase outputs ranging from low KWs to 4MW. Dozens of manufactures from around the world have certified several thousands of generator models in accordance with UL2200.

These listed 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.

AHJ Support- It is very difficult for an AHJ to fulfill the “approval of equipment” function defined in NEC Article 90.4, and fully evaluate the compliance of an engine generator in accordance with the NEC Annex A referenced American National Standard for Stationary Engine Generator Assemblies, UL2200. NEC 90.4 clearly defines how AHJs address installations when listed equipment is not commercially available and they would apply it to any special applications where listed generators are not available.

Related Information - Engine Generators are not inherently safe and are unique hybrid products that include numerous hazards; Hazardous voltages, high energy AC & DC circuits, low voltage limited energy and communications circuits, mechanical hazards, highly flammable fuels, high temperatures and poisonous exhaust gasses. They include components that control the flow of explosive fuels as well as control the generation of electricity. Generators need appropriate ratings to be properly installed per the NEC. It is critical that these generators operate within required voltage and frequency ranges otherwise the safety of electrical loads powered by them can be compromised. Supply voltage outside the normal range defined in load product safety standards can result in risk of electric shock and fire. Much like furnaces and water heaters UL2200, requires redundancy for fuel shutoff valves to protect from single point fuel system failures that could result in the uncontrolled flow of gas that has resulted in catastrophic explosions. UL2200 listings address many safety hazards and 445.6 would make it much easier for AHJs to approve engine generator installations.

**Related Item**

- Public Input No. 3956-NFPA 70-2017

**Submitter Information Verification**

**Submitter Full Name:** Timothy Zgonena  
**Organization:** UL LLC  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Thu Aug 30 09:41:42 EDT 2018  
**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR  
**Resolution:** SR-7639-NFPA 70-2018

**Statement:** The addition of a stationary generator listing requirement in 445.6 will address safety concerns for both the electric and fuel control for stationary generators that are rated 600 volts and below.

CMP 13 requests that the NEC Correlating Committee review the new exception and form a task group to explore a requirement in Article 110 to globally address field labeling where the NEC requires a listed product.

**Public Comment No. 3-NFPA 70-2018 [ 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~~ be located so that the generator is readily accessible. Where required, proper ventilation for the generator exhaust shall be provided.

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

**Statement of Problem and Substantiation for Public Comment**

NFPA 37, Section 4.1.1.1 requires that an engine be situated so that the engine is readily accessible for maintenance, repair, or firefighting. The removal of the reference to article 430.14 is for clarity, as the NEC does not require that a motor be accessible or readily accessible, and the requirements for motors do not apply to the location requirements for the engine of a generator.

However proper ventilation is required for generator sets depending on where the generator is installed, and the last sentence adds the requirement to 445.10. The references to Article 110 in PI-3 have been removed for clarity as the requirements in Article 110 apply throughout the NEC and are not required in 445.10

**Related Item**

- PI-3 NFPA 70-2017

**Submitter Information Verification**

**Submitter Full Name:** Brian Baughman

**Organization:** Generac Power Systems Inc

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Mon Jun 25 14:13:58 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected

**Resolution:** The proposed wording is not necessary since 430.14 already covers ventilation. Substantiation has not been provided that all components of a generator must be readily accessible.

**Public Comment No. 1446-NFPA 70-2018 [ 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 and rated ambient temperature~~.

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 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 Comment**

In First Revision 7720, the intention of CMP-13 was to make a revision to article 445.11 (at the end of the first paragraph) to allow marking "the rated temperature rise or the insulation system class and rated ambient temperature" so that it would correlate with similar marking requirements for motors in article 430. Unfortunately, the FR wording got mixed up so that it doesn't match the similar requirement in 430.7(A)(5). This PC corrects the wording.

**Related Item**

- FR 7720

**Submitter Information Verification**

**Submitter Full Name:** Timothy Windey

**Organization:** Cummins Power Generation

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Tue Aug 28 16:17:30 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7640-NFPA 70-2018

**Statement:** This revision deletes the term "Maximum" since the term is already included in the definition of "Available Fault Current" in Article 100.

List item 3 is modified to include generator marking of the temperature rise for only stationary and portable generators rated 15 kW or more. Similar text is deleted in the first paragraph.

**Public Comment No. 620-NFPA 70-2018 [ 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 available~~ 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 Comment**

The word "maximum" needs to be deleted since "available fault current" is defined as maximum.

**Related Item**

- FR7720

**Submitter Information Verification**

**Submitter Full Name:** Daniel Neeser  
**Organization:** Eaton's Bussmann Division  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Tue Aug 14 10:20:06 EDT 2018  
**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR  
**Resolution:** SR-7640-NFPA 70-2018  
**Statement:** This revision deletes the term "Maximum" since the term is already included in the definition of "Available Fault Current" in Article 100.

List item 3 is modified to include generator marking of the temperature rise for only stationary and portable generators rated 15 kW or more. Similar text is deleted in the first paragraph.

**Public Comment No. 912-NFPA 70-2018 [ 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) Temperature Rise at rated output kVA and 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 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 Comment**

To state insulation class without a temperature rise at a specific load level for a commercial generator is meaningless. In order for a designer or other authority to verify that an alternator is safely applied, the temperature rise at a specific kVA level along with the insulation class allows verification that the machine is safely applied based on the expected duty cycle. It also allows a designer to verify that the equipment has been supplied as required by project specifications and based on the expected duty cycle of the equipment.

For example, if an alternator is selected based on a full load rating at 125C temperature rise and Class H insulation, it can safely operate at the rated output continuously. However, if the same machine is provided with Class F insulation, it could only operate intermittently at the same kVA level without violating the temperature rise limits of the machine.

Further, unlike motor applications, an alternator is often over-sized to provide acceptable levels of voltage control when transient loads occur. Where a motor will prematurely fail if it is overloaded, an alternator may not meet voltage quality requirements which could result in failure to successfully power critical loads. So, even if the terminology and practice works in the "motor world" it is not appropriate for alternator applications.

**Related Item**

- FR-7720

**Submitter Information Verification**

**Submitter Full Name:** Gary Olson

**Organization:** Kw Rx Llc

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Mon Aug 20 15:46:32 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7640-NFPA 70-2018

**Statement:** This revision deletes the term “Maximum” since the term is already included in the definition of “Available Fault Current” in Article 100.

List item 3 is modified to include generator marking of the temperature rise for only stationary and portable generators rated 15 kW or more. Similar text is deleted in the first paragraph.



## Public Comment No. 212-NFPA 70-2018 [ Section No. 445.13 ]

### 445.13 Ampacity of 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 generator distribution device(s) containing overcurrent protection 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.*

#### (B) Overcurrent Protection Provided.

Where the generator set is equipped with a listed overcurrent protective device in accordance with 445.12, or a combination of a current transformer and overcurrent relay, the ampacity of the conductors from the generator field wiring terminals shall not be less than the rating of the generator overcurrent protection device. 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.

*Informational Note to (B): Generator controllers may additionally perform other secondary functions, such as but not limited to, overcurrent protection, overload protection, ground fault protection, and short circuit current interruption.*

## Statement of Problem and Substantiation for Public Comment

This Public Comment revises resolved Public Comment No 1 for clarity, as there are generators equipped with and without overcurrent protection. Overcurrent protection devices are not required by the UL 2200 Standard to be included within the generator set and may not be provided by the manufacturer. When overcurrent protection has not been provided by the manufacturer, 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 overcurrent condition. The proposed language adds clarity on how to size generator feeder conductors when the generator is not provided with overcurrent protection.

Many generator manufacturers will incorporate a type of listed internal overcurrent protection, either with circuit breakers, fuses, overcurrent relays, or with the generator controller into the generator during production. The change provides clarity that the feeder conductors are to be sized in accordance with the rating of the overcurrent device when equipped within the generator. The UL 6200 Standard Controls for Stationary Engine Driven Assemblies permits the controller to perform other secondary functions, such as battery charging, generator voltage regulation, power factor adjustment, overload protection, short circuit interruption, ground fault protection, and many other types of protection.

These generator controllers with overload and overcurrent protection will shut the generator down on an overload alarm, and are permitted in 445.12 and 240.21(G) to protect the generator feeder conductors. The exception to 445.13(A) was incorporated into positive code language into 445.13(B) as the exception would no longer be necessary as the proposed language requires the feeder conductors to be sized in accordance with the generator overcurrent protective device. 445.11(4) requires the generator manufacturer to indicate how the generator is protected against overload.

#### Related Item

- PI-1 NFPA 70-2017

## Submitter Information Verification

**Submitter Full Name:** Brian Baughman

**Organization:** Generac Power Systems Inc

**Street Address:**

**City:**

**State:****Zip:****Submittal Date:** Mon Jul 16 11:13:41 EDT 2018**Committee:** NEC-P13**Committee Statement****Committee Action:** Rejected**Resolution:** Technical substantiation has not been provided to remove the exception in 445.13. The requirements for sizing conductors on the load side of an overcurrent device are found in Article 240.

**Public Comment No. 1832-NFPA 70-2018 [ 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 Comment**

Substantiation- Engine Generators are regularly located in both wet and dry general access areas including areas where children play. The NEC does not presently require engine generators to comply with the US national Standard UL2200 and 445.14 presently allows for voltage levels that could result in electric shock.

Standard for Stationary Engine Generator Assemblies which addresses this specific electric shock concern. UL2200 and most other US product safety standards include the same requirements for accessible live parts to prevent risk of electric shock.

The physiological effects of electrical shock are correlated to the current magnitude passing through the body. With the understanding of human body resistance and engineering experience, voltage thresholds were therefore developed and used by UL and IEC standards. Below are voltage limits listed in UL 2200 and the National Electrical Code (NEC). UL 2200 has long established 42.4 volts AC peak and 60 volts DC as the Class II limits for dry contact with energized parts, which correlate to the values found in the 2017 NEC, Article 725 for Class II circuits. These thresholds were selected to protect against immobilization (inability to let-go), assuming dry conditions. For wet contact conditions, the voltages for Class II circuits are limited to half that of the dry condition, as specified in UL 2200 and also NEC Table 11 (B). The below limits are for accessible circuit AC and DC voltages in dry and wet conditions.

Risk of electric shock – Maximum voltages

1. Sinusoidal, ac 30 V rms(dry), 15 V rms (wet)
2. Nonsinusoidal, ac 42.4 V (dry), peak 21.2 V peak (wet)
3. Pure dc 60 V (dry), 30 V (wet)

The existing 445.14 limits exceed known published safe accessible voltage limits and should be reduced to match the common limits published in US National Standard for generators, US national standards for other equipment installed in wet locations and also NEC article 725. Additional information can be found on the hazards associated with higher exposure voltages and associated currents in the standard IEC 60479-1, Effects of current on human beings and livestock – Part 1: General aspects.

**Related Item**

- Public Input No. 3957-NFPA 70-2017

**Submitter Information Verification**

**Submitter Full Name:** Timothy Zgonena

**Organization:** UL LLC

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Thu Aug 30 09:31:44 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected

**Resolution:** The submitter has not provided sufficient technical substantiation that the present voltage demarcation of 50 volts ac or 60 volts dc is not adequate.



## Public Comment No. 1323-NFPA 70-2018 [ Section No. 445.18 ]

### **445.18** Disconnecting Means and ~~Emergency Stop Switch~~ Prime Mover Shutdown .

#### **(A)** Disconnecting Means.

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

#### **(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
- (3) The means of shutdown shall be labeled

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) , and (B)(3) .

Informational Note: See NFPA 110, *Standard for Emergency and Standby Power Systems* , for information on manual remote stop station requirements.

#### **(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.

#### **(D)** First Responder Shutdown Means in One- and Two-Family Dwelling Units.

For other than cord-and-plug-connected portable generators, a means to shut down the prime mover shall be located outside the dwelling unit at a readily accessible location. Where the shutdown means required in 445.18(B) is outdoors in a readily accessible location, an additional shutdown means shall not be required. The shutdown means shall be permitted to be installed on the exterior of the generator enclosure. The First Responder Shutdown Means shall be labeled.

## Additional Proposed Changes

| <u>File Name</u>                          | <u>Description</u>                       | <u>Approved</u> |
|-------------------------------------------|------------------------------------------|-----------------|
| Optional_Standby_Prime_Mover_Shutdown.jpg | Picture of a prime mover shutdown switch |                 |
| Photograph_release_letter.pdf             | Photograph release letter                |                 |

## Statement of Problem and Substantiation for Public Comment

The change in the title is for editorial purposes and clarity as the term "Emergency Stop Switch" does not appear in the parent text in Article 445.18. A new 445.18(B)(3) would require all prime mover shutdowns to be labeled in the field. The new Informational Note in 445.18(B) would direct the code user to NFPA 110 for Emergency and Legally Required generator installations, as NFPA 110 requires the installation of remote manual stop stations to shutdown the prime mover. Optional standby generators are not required by the language in 445.18(B) or NFPA 110 to have red mushroom style manual stop stations, even though the installation of one would meet the requirements.

The language to 445.18(D) provides clarity that the shutdown means can be installed on the exterior of optional standby generator enclosure that is installed on a one- or two-family dwelling unit. NFPA 37 requires that any engine be situated so it is readily accessible for maintenance, repair, and firefighting purposes. A properly placed generator would be readily accessible, and the first responder primer shutdown installed on the enclosure would be as well.

### Related Item

- First Revision No. 7770-NFPA 70-2018

## Submitter Information Verification

**Submitter Full Name:** Brian Baughman

**Organization:** Generac Power Systems Inc  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Mon Aug 27 08:43:11 EDT 2018  
**Committee:** NEC-P13

### Committee Statement

**Committee Action:** Rejected but see related SR

**Resolution:** [SR-7645-NFPA 70-2018](#)

**Statement:** The term remote emergency stop switch is added in certain sections of 445.18 to correlate with NFPA 110. The term is only used in relation to the stop switch located external to the emergency generator.

The title to 445.18 is changed to better clarify that this section covers both the disconnecting of the emergency generator as well as the emergency shutdown.

The shutdown of the prime mover has been separated into two sections to clarify the basic emergency shutdown feature and the remote emergency shutdown located outside the generator housing.

The term "First Responder Shutdown Means" is changed to "Emergency Shutdown" to better correlate with terminology used both in Article 445 and the remainder of the Code.



AUXILIARY SHUTDOWN

DESCONEXIÓN AUXILIAR

ARRÊT AUXILIAIRE



## Public Comment No. 1419-NFPA 70-2018 [ Section No. 445.18 ]

### 445.18 Disconnecting Means and Emergency Stop Switch.

#### (A) Disconnecting Means.

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

#### (B) ~~Shutdown of Prime Mover~~ Emergency Stop Switch.

Generators shall have ~~provisions to shut down the prime mover. The means of shutdown~~ an emergency stop switch, which shall comply with all of the following requirements:

- (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~~ The emergency stop switch 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 For 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~~ , an additional emergency stop switch 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.

#### (D) ~~First Responder Shutdown Means in One~~ Responder Emergency Stop Switch for One - and Two-Family Dwelling Units.

For other than cord-and-plug-connected portable generators, ~~a means to shut down the prime mover shall~~ an emergency stop switch shall be located outside the dwelling unit at a readily accessible location. Where ~~the shutdown means required~~ the emergency stop switch required in 445.18(B) is outdoors in a readily accessible location, an additional shutdown means shall not be required.

## Statement of Problem and Substantiation for Public Comment

In the first draft meeting, CMP-13 changed the 445.18 section title to "Disconnecting Means and Emergency Stop Switch". This was a good and needed change. The subsection A title and content match the section title nicely. The subsection B title and content, however, now don't match the section title.

This PC changes the subsection B title and content to remove "shutdown of prime mover" and replace it with "emergency stop switch".

With this change, the NEC will also be harmonized with NFPA 110-2019, ISO 8528-13 (Safety Standard for Generating Sets), and industry standard terminology.

### Related Item

- PI 3471

## Submitter Information Verification

**Submitter Full Name:** Timothy Windey

**Organization:** Cummins Power Generation

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Tue Aug 28 11:48:19 EDT 2018

**Committee:** NEC-P13

## Committee Statement

**Committee Action:** Rejected but see related SR

**Resolution:** [SR-7645-NFPA 70-2018](#)

**Statement:** The term remote emergency stop switch is added in certain sections of 445.18 to correlate with NFPA 110. The term is only used in relation to the stop switch located external to the emergency generator.

The title to 445.18 is changed to better clarify that this section covers both the disconnecting of the emergency generator as well as the emergency shutdown.

The shutdown of the prime mover has been separated into two sections to clarify the basic emergency shutdown feature and the remote emergency shutdown located outside the generator housing.

The term "First Responder Shutdown Means" is changed to "Emergency Shutdown" to better correlate with terminology used both in Article 445 and the remainder of the Code.



## Public Comment No. 2065-NFPA 70-2018 [ Section No. 445.18 ]

### 445.18 Disconnecting Means and ~~Emergency Stop Switch~~ Prime Mover shutdown .

#### (A) Disconnecting Means.

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

#### (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~~ a 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).

#### (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.

#### (D) First Responder Shutdown Means in One- and Two-Family Dwelling Units.

For other than cord-and-plug-connected portable generators, a means to shut down the prime mover shall be located outside the dwelling unit at a readily accessible location. Where the shutdown means required in 445.18(B) is outdoors in a readily accessible location, an additional shutdown means shall not be required.

## Statement of Problem and Substantiation for Public Comment

The term "Emergency Stop Switch" is not used in the text of article 445.18, therefore should not be in the title. The change to the title will provide consistency in wording and clarity. The text "Prime Mover shutdown" is used in the text of article 445.18. The requirement in 2) is for the shutdown to have a reset. Specifying a specific type of reset (mechanical) is not necessary and limiting. Also there is no definition for "mechanical reset" so using this wording may lead to confusion when applying this clause of the code. The goal is for the prime mover not to restart once the mechanism that initiated the shutdown is released. This requires a separate action to provide a reset of the shutdown function. This requirement can be met in several different ways of which "mechanical" is only one.

### Related Item

- PI 4195

## Submitter Information Verification

**Submitter Full Name:** Jeff Jonas  
**Organization:** Generac Power Systems, Inc.  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submission Date:** Thu Aug 30 15:58:50 EDT 2018  
**Committee:** NEC-P13

## Committee Statement

**Committee Action:** Rejected but see related SR  
**Resolution:** SR-7645-NFPA 70-2018

**Statement:** The term remote emergency stop switch is added in certain sections of 445.18 to correlate with NFPA 110. The term is only used in relation to the stop switch located external to the emergency generator.

The title to 445.18 is changed to better clarify that this section covers both the disconnecting of the emergency generator as well as the emergency shutdown.

The shutdown of the prime mover has been separated into two sections to clarify the basic emergency shutdown feature and the remote emergency shutdown located outside the generator housing.

The term "First Responder Shutdown Means" is changed to "Emergency Shutdown" to better correlate with terminology used both in Article 445 and the remainder of the Code.



## Public Comment No. 928-NFPA 70-2018 [ Section No. 445.18 ]

### **445.18** ~~Disconnecting Means and~~ Emergency Stop Switch.

(A)–

#### **or Disconnecting Means**

–

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

(B

#### **(A ) Shutdown of Prime Mover.**

~~Generators shall have provisions to shut down the prime mover and prevent it from re-starting from any control switch . 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).~~

#### **( B ) Disconnecting Means.**

~~Generators other than cord-and-plug-connected portable generators shall have one or more disconnecting means when the provisions of 445.18 (A) are not provided. Each disconnecting means shall simultaneously open all associated ungrounded conductors. Each disconnecting means shall be lockable open in accordance with 110.25 .~~

–

#### **( C ) Generators Installed in Parallel.**

~~Where a generator is installed in parallel with other generators or other AC source , the provisions of 445.18(~~

~~A~~

~~B ) shall be~~

~~capable of~~

~~provided for isolating the generator output terminals from the~~

~~paralleling equipment~~

~~AC source . The disconnecting means shall not be required to be located at the generator.~~

#### **(D) First Responder Shutdown Means in One- and Two-Family Dwelling Units.**

~~For other than cord-and-plug-connected portable generators, a means to shut down the prime mover shall be located outside the dwelling unit at a readily accessible location. Where the shutdown means required in 445.18(~~

~~B~~

~~A ) is outdoors in a readily accessible location, an additional shutdown means shall not be required.~~

## Statement of Problem and Substantiation for Public Comment

The Title of this section can be taken to require both a disconnecting means and a means to shut down the generator, since it uses the term "and" in the title. Use of the term "or" is thus more appropriate.

By far the safest way to prevent damage or personal injury with a generator set is to prevent it from operating. When a simple disconnect means such as a circuit breaker is used, the genset can still attempt to start and cause injury through electrocution or physical injury, or property damage. While there are means available to prevent this from happening (such as lifting a battery cable), it would seem reasonable to make the safest means to prevent damage or personal injury as the first

requirement of this section.

With the reordered paragraphs, it becomes more clear that the only time a disconnect means is actually required is if you don't meet the requirements of paragraph A, or if you have paralleled generators.

If the panel does not agree with the reorganization of the paragraphs, I would hope they would at least change the "and" in the title to "or"; as that is certain to be a problem, no matter how paranoid I sound.

**Related Item**

• FR-7770

## Submitter Information Verification

**Submitter Full Name:** Gary Olson

**Organization:** Kw Rx Llc

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Mon Aug 20 16:19:52 EDT 2018

**Committee:** NEC-P13

## Committee Statement

**Committee Action:** Rejected but see related SR

**Resolution:** [SR-7645-NFPA 70-2018](#)

**Statement:** The term remote emergency stop switch is added in certain sections of 445.18 to correlate with NFPA 110. The term is only used in relation to the stop switch located external to the emergency generator.

The title to 445.18 is changed to better clarify that this section covers both the disconnecting of the emergency generator as well as the emergency shutdown.

The shutdown of the prime mover has been separated into two sections to clarify the basic emergency shutdown feature and the remote emergency shutdown located outside the generator housing.

The term "First Responder Shutdown Means" is changed to "Emergency Shutdown" to better correlate with terminology used both in Article 445 and the remainder of the Code.

**Public Comment No. 1274-NFPA 70-2018 [ Section No. 445.18(D) ]****(D) ~~First Responder Emergency~~ Shutdown Means in One- and Two-Family Dwelling Units.**

For other than cord-and-plug-connected portable generators, a means to shut down the prime mover shall be located outside the dwelling unit at a readily accessible location. Where the shutdown means required in 445.18(B) is outdoors in a readily accessible location, an additional shutdown means shall not be required.

**Statement of Problem and Substantiation for Public Comment**

This public comment seeks correlation with new requirements in 230.82 and 230.85.

The term "emergency" should be used to correlate throughout the NEC. There are many types of events or occurrences that would necessitate immediate shutdown. "Emergency" is the correct term.

**Related Item**

- FR 7846

**Submitter Information Verification**

**Submitter Full Name:** James Dollard

**Organization:** IBEW Local Union 98

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Sat Aug 25 10:15:42 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7645-NFPA 70-2018

**Statement:** The term remote emergency stop switch is added in certain sections of 445.18 to correlate with NFPA 110. The term is only used in relation to the stop switch located external to the emergency generator.

The title to 445.18 is changed to better clarify that this section covers both the disconnecting of the emergency generator as well as the emergency shutdown.

The shutdown of the prime mover has been separated into two sections to clarify the basic emergency shutdown feature and the remote emergency shutdown located outside the generator housing.

The term "First Responder Shutdown Means" is changed to "Emergency Shutdown" to better correlate with terminology used both in Article 445 and the remainder of the Code.

**Public Comment No. 1546-NFPA 70-2018 [ Section No. 445.18(D) ]****(D) – ~~First Responder Shutdown~~ Emergency Shutdown Means in One- and Two-Family Dwelling Units.**

For other than cord-and-plug-connected portable generators, a means to shut down the prime mover shall be located outside the dwelling unit at a readily accessible location. Where the shutdown means required in 445.18(B) is outdoors in a readily accessible location, an additional shutdown means shall not be required.

**Statement of Problem and Substantiation for Public Comment**

This Public Comment is being submitted by a Correlating Committee Task Group that was created as a result of Correlating Committee Note No. 65. Members of the Task Group included Larry Ayer (Co-Chair), James Dollard, David Hittinger, Vince Saporita (Co-Chair), and David Williams. The Correlating Committee directed the Task Group to review the term “Emergency disconnect switches” and correlate it with the terminology used in FR-8642 (new Section 230.85), FR 7770 (Section 445.18(A)), and FR 8942 (Section 706.15).

The term “emergency disconnect switches” is changed to “emergency disconnects” in new 230.82(10) to correlate with the term in new 230.85.

The term “emergency disconnect(s)” is changed to “emergency disconnects”, “switch(es)” is changed to “switches”, and “breaker(s)” is changed to “breakers” in 230.85 to agree with the NEC Style Manual.

For FR 8874, the term “Emergency stop switch” is used correctly in title of 445.18 and therefore no changes are necessary.

For FR 7846 (Section 445.18(D)), the term “First Responder Shutdown” is changed to “Emergency Shutdown” for correlation with these other changes.

For FR 8942 (Section 706.15), the ESS disconnecting means, or its remote control, must be grouped with the emergency disconnects required in new 230.85, for the safety of first responders. Unless the ESS switch or its remote control is in close proximity when first responders try to de-energize the service of the dwelling unit by utilizing the outdoor emergency disconnects required by new 230.85, they will expect that the entire dwelling unit is totally de-energized. If the ESS switch, or its remote control, is not in close proximity, the first responders may not know that the dwelling unit is still energized. The revised requirement will help the first responders recognize that there is an additional disconnecting means that is necessary to totally de-energize the dwelling unit. The term “ESS disconnecting means” is used correctly in 706.15.

**Related Item**

- FR 7846

**Submitter Information Verification**

**Submitter Full Name:** Vincent Saporita

**Organization:** Eaton's Bussmann Business

**Affiliation:** Eaton's Bussmann Business

**Street Address:**

**City:**

**State:**

**Zip:**

**Submission Date:** Wed Aug 29 11:26:09 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7645-NFPA 70-2018

**Statement:** The term remote emergency stop switch is added in certain sections of 445.18 to correlate with NFPA 110. The term is only used in relation to the stop switch located external to the emergency generator.

The title to 445.18 is changed to better clarify that this section covers both the disconnecting of the emergency generator as well as the emergency shutdown.

The shutdown of the prime mover has been separated into two sections to clarify the basic emergency

shutdown feature and the remote emergency shutdown located outside the generator housing.

The term "First Responder Shutdown Means" is changed to "Emergency Shutdown" to better correlate with terminology used both in Article 445 and the remainder of the Code.

**Public Comment No. 1527-NFPA 70-2018 [ Section No. 445.20 ]****445.20** Ground-Fault Circuit-Interrupter Protection for Receptacles on 15-kW or Smaller Portable Generators.

~~Receptacle-~~ In addition to the requirements in 210.8, ~~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 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 590.6(A)(3) 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 Comment**

This Public Comment is the work of an NEC Correlating Committee task group directed to develop standardized text to improve correlation, clarity and usability of the NEC. This effort identified GFCI requirements that supplement or modify the general requirements of 210.8. The present GFCI requirements throughout the NEC were developed by various Technical Committees when the general GFCI requirements in 210.8 were limited to dwelling units. The consequences of time and various committees working to enhance safety have created significant correlation issues with the general requirements in 210.8. The arrangement of the NEC, as detailed in 90.3 clarifies that the general requirements of Chapters 1 through 4 apply "generally to all electrical installations." The work of this Task Group resulted in 41 public comments to provide necessary correlation, clarity and usability. The task group's work was identified in and based upon Correlating Committee Note 152 to the 2020 First Revisions. The Task Group members consisted of Jim Dollard, Chair, Steve Campolo, Donny Cook, Tom Domitrovich, Mark Hilbert, Keith Lofland, Alan Manche and Steve Rood.

**Related Item**

- CCN 152

**Submitter Information Verification**

**Submitter Full Name:** James Dollard

**Organization:** IBEW Local Union 98

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Wed Aug 29 10:20:16 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected

**Resolution:** The addition of the reference to 210.8 is not appropriate for this section. 445.20 refers to GFCI protection on small portable generators. 210.8 refers to GFCI protection for premises wiring.

**Public Comment No. 213-NFPA 70-2018 [ 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 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 outlet(s) is interlocked such that it is not available for use when any 125/250-volt receptacle(s) is in use.*

Informational Note: Refer to 250.26 and 250.34 (C) for the grounded conductor requirements for portable generators where the portable generator is a component of a separately derived system.

**(B)** Bonded Neutral Generators.

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

Informational Note No. 1 : Refer to 590.6(A)(3) for GFCI requirements for 15-kW or smaller portable generators used for temporary electric power and lighting.

Informational Note No. 2: Refer to 250.30 for the grounding requirements for portable generators supplying fixed wiring systems.

*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**

| <u>File Name</u>                      | <u>Description</u>           | <u>Approved</u> |
|---------------------------------------|------------------------------|-----------------|
| OSHA_Standard_Interpretation_1_2_.pdf | OSHA Standard Interpretation |                 |
| OSHA_Standard_Interpretation_2_2_.pdf | OSHA Standard Interpretation |                 |
| OSHA_Standard_Interpretation_3_2_.pdf | OSHA Standard Interpretation |                 |

**Statement of Problem and Substantiation for Public Comment**

The Public Comment addresses resolved PI-6 and amends the PI into Information Notes for clarity. The requirements in Articles 250.34(C) and 250.26 state that an unbonded portable generator shall not be a component of a separately derived system. The creation of the new information notes will direct the code user to the appropriate articles that have purview over the grounding and bonding of all portable generators.

**Related Item**

- PI-6 NFPA 70- 2017

**Submitter Information Verification**

**Submitter Full Name:** Brian Baughman

**Organization:** Generac Power Systems Inc

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Mon Jul 16 11:31:26 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected

**Resolution:** Adding NEC references for grounded conductor requirements may create confusion to the user of this section.

Standard Interpretations (/laws-regs/standardinterpretations/publicationdate)

/ Safety of employees in the workplace where portable generators are used as power sources.

1910.302 ([https://www.osha.gov/pls/oshaweb/owalink.query\\_links?](https://www.osha.gov/pls/oshaweb/owalink.query_links?src_doc_type=STANDARDS&src_unique_file=0&src_anchor_name=1910.302)

- **Standard Number:** src\_doc\_type=STANDARDS&src\_unique\_file=0&src\_anchor\_name=1910.302)

OSHA requirements are set by statute, standards and regulations. Our interpretation letters explain these requirements and how they apply to particular circumstances, but they cannot create additional employer obligations. This letter constitutes OSHA's interpretation of the requirements discussed. Note that our enforcement guidance may be affected by changes to OSHA rules. Also, from time to time we update our guidance in response to new information. To keep apprised of such developments, you can consult OSHA's website at <http://www.osha.gov> (/).

November 5, 1991

Mr. Lawrence R. Roche  
Senior Project Engineer  
WINCO, Inc.  
225 South Carolina Avenue  
Le Center, Minnesota 56057

Dear Mr. Roche:

This is in response to your letter of July 16 requesting written clarification regarding the safety of employees in the workplace where portable generators are used as power sources in separately derived systems. Thank you for follow-up information forwarded by your letter of August 9. The three questions you asked and the corresponding replies follow. Please accept our apology for the delay in response.

**Question 1:** "Is bonding the neutral of a portable

generator to the general frame optional?"

**Reply:** a. If a portable generator is to be used as an electrical power source in a separately derived system, as opposed to a service supplied system such as is installed permanently in a building, a neutral (ground) conductor **must** be bonded to the portable generator frame; it is not optional.

b. Given a. above, the frame of a portable generator is not required to be grounded when supplying electricity to equipment mounted on the generator if the noncurrent carrying metal parts of the equipment are bonded to the generator frame.

- c. Given a. and b. above, the frame of a portable generator is not required to be grounded when supplying electricity to equipment through receptacles mounted on the generator by way of directly-connected or plug-connected conductor cables if the grounding conductor terminals of the receptacles are bonded to the generator frame. Grounding continuity from equipment through the conductor cable to the receptacle is required.
- d. A separately derived system ceases to exist when the neutral of its portable generator (or other alternating current (AC) power source) is interconnected to the neutral of a service-supplied system.
- e. For grounding of portable generators supplying fixed wiring systems reference is made to the National Electrical Code (NEC), section 250-5(d).

**Question 2:** "If the portable generator as defined by

NEC Section 250-6(a)(i) and (2) is a three wire 120/240 volt unit, is bonding of the neutral to the generator frame still optional?"

**Reply:** The preceding response to question 1 also applies to three wired 120/240 volt portable generators used as electrical power sources in separately derived systems.

**Question 3:** "Does NEC Section 250-6(c), describing

neutral bonding of a separately derived system apply even to portable generators as defined above?"

**Reply:** Yes, Section 250-6(c), as clarified by the reply to question number 1, applies to three wire 120/240 volt portable generators used as electrical power sources in separately derived systems.

We appreciate your interest in employee safety and health. If we can be of further assistance, please do not hesitate to contact us.

Sincerely,

Patricia K. Clark, Director  
Directorate of Compliance Programs

UNITED STATES  
DEPARTMENT OF LABOR

(<https://www.dol.gov>)

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Standard Interpretations (/laws-regs/standardinterpretations/publicationdate)

/ Approval of Portable Generators by a qualified testing laboratory.

- **Standard Number:** 1926.403 ([https://www.osha.gov/pls/oshaweb/owalink.query\\_links?src\\_doc\\_type=STANDARDS&src\\_unique\\_file=0&src\\_anchor\\_name=1926.403](https://www.osha.gov/pls/oshaweb/owalink.query_links?src_doc_type=STANDARDS&src_unique_file=0&src_anchor_name=1926.403));  
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October 1, 1991

Mr. Colin Iwasa  
OPE Product Coordinator  
Yamaha Motor Corporation  
6555 Katella Avenue  
Cypress, California 90630

Dear Mr. Iwasa:

This is in response to your August 14, 1991, letter requesting clarification of the Occupational Safety and Health Administration's (OSHA) electrical standards pertaining to portable generators.

In regard to your question whether portable or vehicle mounted generators on a job site are required to be listed, labeled or certified, please be advised that OSHA has no such requirement. However, paragraph (a) of 29 CFR 1926.403 requires all electrical conductors and equipment to be "approved". OSHA has determined that equipment listed, labeled, or certified to be safe by a qualified testing laboratory, is considered to be "approved". (A copy of 29 CFR 1926, Subpart K is enclosed. Please see the definitions of "acceptable" and "approved".)

In regard to your question whether a 120/240 volt portable generator rated at 5000 watts is required to have the neutrals bonded, please be advised as follows: A neutral conductor shall be bonded to the generator frame when the generator is a component of a separately derived system. (See 29 CFR 1926.404(f)(3)(iii)). Thus, where the generator supplies only equipment mounted on the generator and/or cord- and plug-connected equipment through receptacles mounted on the generator and the noncurrent-carrying metal parts of equipment and equipment grounding conductor terminals of the receptacles are bonded to the generator frame, then the portable generator frame is not required to be grounded and is permitted to serve as the grounding electrode. (See 29 CFR, 1926.404(f)(3)(i)). However, portable generators supplying fixed wiring systems are not generally considered to be separately derived systems and usually have to be grounded. An alternating-current power source such as an on-site generator is not a separately derived system if the neutral is solidly interconnected to a service-supplied system neutral. In such cases, the neutral conductor of a single-phase, 3 wire system must be grounded. (See 29 CFR 1926.404(f)(1), (4), and (5)).

If we can be of further assistance, please contact Mr. Roy Gurnham, Director, Office of Construction and Maritime Compliance Assistance, phone (202) 523-8136.

Sincerely,

Patricia K. Clark, Director  
Directorate of Compliance Programs

## UNITED STATES DEPARTMENT OF LABOR

(<https://www.dol.gov>)

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Standard Interpretations (/laws-regs/standardinterpretations/publicationdate)  
/ Portable and vehicle mounted generators must be "approved" on the job site.

- **Standard Number:** 1926.403 ([https://www.osha.gov/pls/oshaweb/owalink.query\\_links?src\\_doc\\_type=STANDARDS&src\\_unique\\_file=0&src\\_anchor\\_name=1926.403](https://www.osha.gov/pls/oshaweb/owalink.query_links?src_doc_type=STANDARDS&src_unique_file=0&src_anchor_name=1926.403));  
1926.449 ([https://www.osha.gov/pls/oshaweb/owalink.query\\_links?src\\_doc\\_type=STANDARDS&src\\_unique\\_file=0&src\\_anchor\\_name=1926.449](https://www.osha.gov/pls/oshaweb/owalink.query_links?src_doc_type=STANDARDS&src_unique_file=0&src_anchor_name=1926.449))

OSHA requirements are set by statute, standards and regulations. Our interpretation letters explain these requirements and how they apply to particular circumstances, but they cannot create additional employer obligations. This letter constitutes OSHA's interpretation of the requirements discussed. Note that our enforcement guidance may be affected by changes to OSHA rules. Also, from time to time we update our guidance in response to new information. To keep apprised of such developments, you can consult OSHA's website at <http://www.osha.gov> (/).

June 28, 1993

Mr. Colin Iwasa  
Yamaha Power Equipment  
6555 Katella Avenue  
Cypress, California 90630

Dear Mr. Iwasa:

This is in response to your December 20, 1991, letter requesting clarification of Occupational Safety and Health Administration (OSHA) standards concerning portable and vehicle mounted generators. I apologize for the excessive delay in responding to your inquiry.

In regard to whether portable and vehicle mounted generators on a construction job site are required to be listed, labeled or certified, please be advised that all electrical conductors and equipment are required to be "approved," according to 1926.403(a). Section 1926.449 includes definitions of terms used in the Electrical Standards for Construction, contained in Subpart K of 29 CFR Part 1926. The definitions of "approved" and "acceptable" indicate what constitutes approval under Subpart K of the Construction Standards.

An installation or equipment is acceptable to the Assistant Secretary of Labor, and approved within the meaning of this Subpart K:

- (a) If it is accepted, or certified, or listed, or labeled, or otherwise determined to be safe by a qualified testing laboratory capable of determining the suitability of materials and equipment for installation and use in accordance with this standard; or
- (b) With respect to an installation or equipment of a kind which no qualified testing laboratory accepts, certifies, lists, labels, or determines to be safe, if it is inspected or tested by another Federal agency, or by a State, municipal or other local authority responsible for enforcing occupational safety provisions of the National Electrical Code, and found in compliance with those provisions; or
- (c) With respect to custom-made equipment or related installations which are designated, fabricated for, and intended for use by a particular customer, if it is determined to be safe for its intended use by its manufacturer on the basis of test data which the employer keeps and makes available for inspection to the Assistant Secretary and

his authorized representatives.

Electric equipment (i.e., generators) meeting (a), (b) or (c) above will be considered approved by OSHA.

In regard to whether portable and vehicle mounted generators are included in the definition of "equipment" for purposes of Subpart K, please be advised that "equipment" is defined as follows:

A general term including material, fittings, devices, appliances, fixtures, apparatus, and the like, used as a part of, or in connections with, an electrical installation.

This definition clearly includes an electric generator supplying power to other electric equipment used on a jobsite.

In regard to a separately derived system, please be advised that the National Electrical Code (National Fire Protection Association, NFPA 70) contains information useful in determining whether a portable or vehicle-mounted electric generator is being used as part of a separately derived system. Section 250-5(d) of this code contains the following explanation:

**(d) Separately Derived Systems.** A premises wiring system whose power is derived from generator, transformer, or converter windings and has no direct electrical connection, including a solidly connected grounded circuit conductor, to supply conductors originating in another system...

(FPN No. 1): An alternate alternating-current power source such as an on-site generator is not a separately derived system if the neutral is solidly interconnected to a service-supplied system neutral.

Thus, a separately derived system has **no** direct electrical connection to another system supplying power at the jobsite, while a non-separately derived system would be directly connected to another system supplying power to the site. A non-separately derived system at the jobsite would not need to have its neutral grounded, because the service-supplied system would already provide this function. Portable and vehicle-mounted generators are typically used to provide primary power for utilization equipment on construction sites and are normally separately derived systems for the purposes of OSHA's electrical standards for construction.

In the OSHA standards for portable vehicle-mounted generators, equipment grounding conductor bonding is mentioned in 1926.404(f)(3)(i)(B) and in 1926.404(f)(3)(ii)(C). Neutral conductor bonding is mentioned in 1926.404(f)(3)(iii).

The intent of 1926.404(f)(3)(iii) becomes very clear when one considers that the term "neutral" is used in its technical sense. A 120/240 volt system has a neutral and therefore must be bonded to the generator frame. A 2-wire 120 volt system has no neutral and therefore bonding is optional. Recall that neither side of a 2-wire derived system is a neutral and when one grounds either side, it becomes a grounded terminal or conductor, but it is not a neutral.

If we can be of any further assistance, please contact me or Mr. Dale R. Cavanaugh of my staff in the Office of Construction and Maritime Compliance Assistance at (202) 219-8136.

Sincerely,

Roy F. Gurnham, P.E., Esq. Director  
Office of Construction and Maritime  
Compliance Assistance

December 20, 1991

Patricia K. Clark  
Directorate of Compliance Programs  
U.S. Department of Labor  
Washington, D.C. 20210

Dear Ms. Clark:

Your letter of October 1, 1991 pertaining to portable and vehicle mounted generators left me somewhat less than clear on OSHA's standards.

The following is my understanding of the information which you provided.

**Labeled, listed, certified.**

Portable and vehicle mounted generators on a job sit are not required to be listed, labeled or certified.

As defined in subpart K, portable and vehicle mounted generators are not "electrical conductors" or "equipment".

**Neutral Bonding**

Neutral bonding is required when the generator is a component of a separately derived system (29 CFR 1926.404(f)(3)(iii)).

A generator is not a component of a separately derived system when it only supplies equipment mounted on the generator and/or cord and plug connected equipment through the generator receptacles.

A generator is a component of a separately derived system when it supplies conductors originating in another system.

29 CFR 1926.404(f)(3)(i) does not refer to neutral bonding.

29 CFR 1926.404(f)(1), (4) and, (5) do not refer to neutral bonding.

If my understanding of your letter is incorrect, inaccurate or incomplete please contact me.

Sincerely,

Colin Iwasa  
Outdoor Power Equipment

UNITED STATES  
DEPARTMENT OF LABOR

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## Public Comment No. 370-NFPA 70-2018 [ Section No. 445.20 ]

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

~~Receptacle outlets- All 125-volt, 15- and 20-ampere receptacles that are a part of a 15-kW or smaller portable or trailer-mounted generator that has a bonded neutral shall have 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~~

~~.~~

~~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 outlet(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 590.6(A)(3) 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.~~

~~shall not be installed on circuits provided on or that are supplied from a generator that has an unbonded neutral.~~

### Additional Proposed Changes

| <u>File Name</u>           | <u>Description Approved</u> |
|----------------------------|-----------------------------|
| 445-20_GFCI_Unbonded.jpg   |                             |
| 445-20_GFCI_Unbonded-2.jpg |                             |

### Statement of Problem and Substantiation for Public Comment

At this point, it seems the question to this Code Making Panel should be, "Do you accept and support the requirements of 110.3(B)"? That section requires that "Listed or labeled equipment shall be installed and used in accordance with any instructions included in the listing or labeling". UL Standard 943 for Ground-Fault Circuit Interrupters contains the following statement in the Guide Information in KCSX, "GFCIs are intended to be used only in circuits where one of the conductors is solidly grounded." For portable or vehicle-mounted generators, this equates to having a bonded neutral. Without such bonding, the GFCI device is nonfunctional because there is no path for ground-fault current to return to the windings of the generator. Note that CMP-5 added vehicle-mounted generators in 250.34.

The provision in this existing section allows portable-type GFCI devices to be used for certain portable generators that do not provide integral GFCI protection. As shown in the attached drawing, the portable GFCI device is also nonfunctional because there is no circuit for ground-fault current to return to the windings of the generator. It seems unconscionable to allow the use of a device that appears to provide GFCI protection for the user, when, in fact, it cannot provide the protection that is indicated. For the reasons that are articulated above, GFCI protection must be permitted only on portable or vehicle-mounted generators that have a bonded neutral.

Accepting this Comment will achieve the safety that can be provided and avoid the false impression of protection from electric shock by a GFCI device, when, it is in fact absent.

#### Related Item

- PI 2896

### Submitter Information Verification

**Submitter Full Name:** Phil Simmons

**Organization:** Simmons Electrical Services

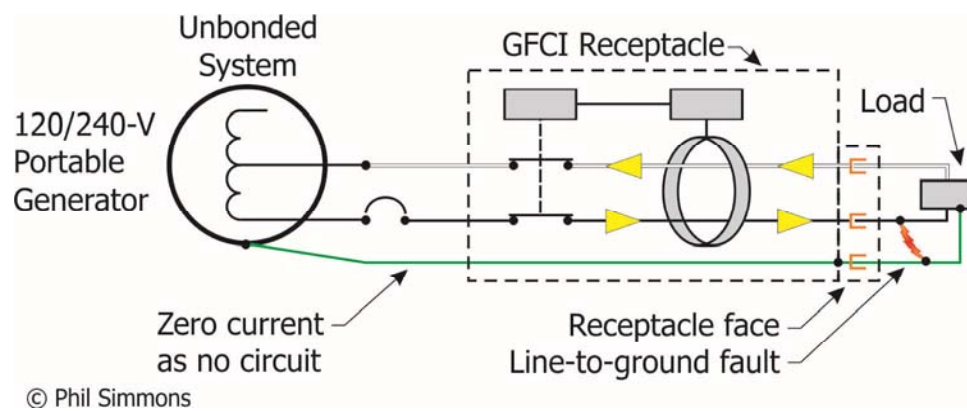
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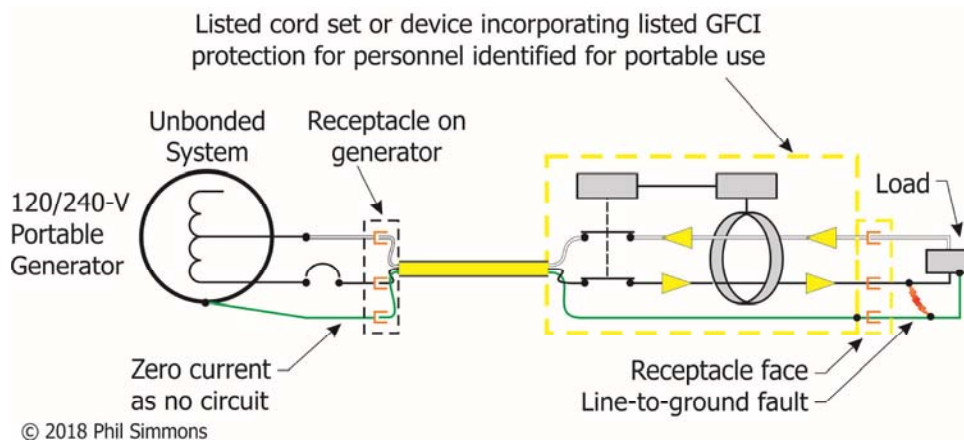
**City:**

**State:**

**Zip:****Submittal Date:** Fri Aug 03 18:07:36 EDT 2018**Committee:** NEC-P13**Committee Statement****Committee Action:** Rejected

**Resolution:** The submitter has not provided sufficient technical reasoning to eliminate the need for GFCI protection on floating neutral generators. Unbonded generators can quickly become bonded generators by the addition of a bonding strap between neutral and ground and where the generator supplies a transfer switch for optional standby in a weather related event or other loss of utility power.





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**Public Comment No. 1793-NFPA 70-2018 [ Section No. 480.1 ]****480.1 Scope.**

This article applies to all stationary installations of storage batteries.

Informational Note: The following standards are frequently referenced for the installation of stationary batteries:

- (1) IEEE 484, *Recommended Practice for Installation Design and Installation of Vented Lead-Acid Batteries for Stationary Applications*
- (2) IEEE 485, *Recommended Practice for Sizing Vented Lead-Acid Storage Batteries for Stationary Applications*
- (3) IEEE 1145, *Recommended Practice for Installation and Maintenance of Nickel-Cadmium Batteries for Photovoltaic (PV) Systems*
- (4) IEEE 1187, *Recommended Practice for Installation Design, and Installation of Valve-Regulated Lead-Acid Batteries for Stationary Applications*
- (5) IEEE 1375, *IEEE Guide for the Protection of Stationary Battery Systems*
- (6) IEEE 1578, *Recommended Practice for Stationary Battery Electrolyte Spill Containment and Management*
- (7) IEEE 1635/ASHRAE 21, *Guide for the Ventilation and Thermal Management of Batteries for Stationary Applications*
- (8) UL 1973, *Standard for Batteries for Use in Stationary, Vehicle Auxiliary Power, and Light Electric Rail (LER) Applications- and Stationary Applications*
- (9) UL Subject 2436, *Outline of Investigation for Spill Containment for Stationary Lead Acid Battery Systems*
- (10) UL 1989, *Standard for Standby Batteries*

**Statement of Problem and Substantiation for Public Comment**

Editorial to match the standard's title.

**Related Item**

- FR-8979

**Submitter Information Verification**

**Submitter Full Name:** Jason Fisher

**Organization:** Tesla Inc.

**Affiliation:** Solar Energy Industries Association (SEIA)

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Thu Aug 30 08:12:39 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7708-NFPA 70-2018

**Statement:** The title of UL 1973 has been changed upon publication of the 2nd edition in 2018. UL Subject 1974, Standard for Evaluation of Repurposed Batteries was deleted from the Informational Note No. 2 list item (14) in 706.1 and moved to the Informational Note in 480.1 as new list item (11) where it is more correctly located as a standard for batteries.

**Public Comment No. 670-NFPA 70-2018 [ Section No. 480.1 ]****480.1 Scope.**

This article applies to all stationary installations of storage batteries.

Informational Note: The following standards are frequently referenced for the installation of stationary batteries:

- (1) IEEE 484, *Recommended Practice for Installation Design and Installation of Vented Lead-Acid Batteries for Stationary Applications*
- (2) IEEE 485, *Recommended Practice for Sizing Vented Lead-Acid Storage Batteries for Stationary Applications*
- (3) IEEE 1145, *Recommended Practice for Installation and Maintenance of Nickel-Cadmium Batteries for Photovoltaic (PV) Systems*
- (4) IEEE 1187, *Recommended Practice for Installation Design, and Installation of Valve-Regulated Lead-Acid Batteries for Stationary Applications*
- (5) IEEE 1375, *IEEE Guide for the Protection of Stationary Battery Systems*
- (6) IEEE 1578, *Recommended Practice for Stationary Battery Electrolyte Spill Containment and Management*
- (7) IEEE 1635/ASHRAE 21, *Guide for the Ventilation and Thermal Management of Batteries for Stationary Applications*
- (8) UL 1973, *Standard for Batteries for Use in ~~Light~~ Stationary, Vehicle Auxiliary Power, and ~~Light~~ Electric Rail (LER) Applications and Stationary Applications Applications*
- (9) UL Subject 2436, *Outline of Investigation for Spill Containment for Stationary Lead Acid Battery Systems*
- (10) UL 1989, *Standard for Standby Batteries*

**Statement of Problem and Substantiation for Public Comment**

The title of UL 1973 has been changed upon publication of the 2nd edition in 2018.

**Related Public Comments for This Document**

| <u>Related Comment</u>                        | <u>Relationship</u> |
|-----------------------------------------------|---------------------|
| Public Comment No. 675-NFPA 70-2018 [Annex A] |                     |
| <u>Related Item</u>                           |                     |
| • FR8103                                      |                     |

**Submitter Information Verification**

**Submitter Full Name:** Laurie Florence  
**Organization:** UL LLC  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Tue Aug 14 21:41:01 EDT 2018  
**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR  
**Resolution:** SR-7708-NFPA 70-2018  
**Statement:** The title of UL 1973 has been changed upon publication of the 2nd edition in 2018. UL Subject 1974, Standard for Evaluation of Repurposed Batteries was deleted from the Informational Note No. 2 list item (14) in 706.1 and moved to the Informational Note in 480.1 as new list item (11) where it is more correctly located as a standard for batteries.

**Public Comment No. 672-NFPA 70-2018 [ Definition: Battery. ]****Battery.**

A single cell, or a group of cells connected together electrically in series, in parallel, or a combination of both.

**Statement of Problem and Substantiation for Public Comment**

This term is really redundant with the term storage battery that is defined in this section also.

**Related Public Comments for This Document**

| <u>Related Comment</u>                                             | <u>Relationship</u> |
|--------------------------------------------------------------------|---------------------|
| Public Comment No. 673-NFPA 70-2018 [Definition: Storage Battery.] |                     |
| <u>Related Item</u>                                                |                     |
| • FR8979                                                           |                     |

**Submitter Information Verification**

**Submitter Full Name:** Laurie Florence  
**Organization:** UL LLC  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Tue Aug 14 22:04:23 EDT 2018  
**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Accepted  
**Resolution:** [SR-7553-NFPA 70-2018](#)  
**Statement:** This term is redundant with the term storage battery that is defined in this section. This change is in concert with SR 7555, changing the definition of "Storage Battery".

**Public Comment No. 673-NFPA 70-2018 [ Definition: Storage Battery. ]****Storage Battery.**

A battery comprised of one or more rechargeable cells of the lead single or a group of rechargeable cells connected together electrically in series, in parallel, or a combination of both comprised lead -acid, nickel-cadmium, or other rechargeable electrochemical types.

**Statement of Problem and Substantiation for Public Comment**

This definition was revised to include information from the definition from the term battery, which is proposed to be deleted as it is redundant in PC 672, and to also remove the term "battery" from the definition.

**Related Public Comments for This Document****Related Comment**

[Public Comment No. 672-NFPA 70-2018 \[Definition: Battery.\]](#)

**Relationship****Related Item**

• FR8979

**Submitter Information Verification**

**Submitter Full Name:** Laurie Florence

**Organization:** UL LLC

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Tue Aug 14 22:06:54 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** [SR-7555-NFPA 70-2018](#)

**Statement:** This definition was editorially revised to include information from the definition from the term "battery," which is deleted as it is redundant.

**Public Comment No. 1077-NFPA 70-2018 [ Section No. 480.7 ]****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.

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 for use by first responders.

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 240 volts nominal between conductors or to ground and subject to field servicing 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.

**(D) Busway.**

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

**(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) Available fault short-circuit current derived from the stationary battery system
- (3) An arc flash label applied in accordance with acceptable industry practice
- (4) Date the calculation was performed

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

Informational Note No. 2: *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.

**(F) Identification of Power Sources.**

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

**(1) Facilities with Utility Services and Battery Systems.**

Plaques or directories shall be installed in accordance with 705.10 and 712.10(A).

*Exception: This requirement does not apply where a disconnect in 480.7(A) is not required.*

**(2) Facilities with Stand-Alone Systems.**

A permanent plaque or directory shall be installed outside a building or structure supplied by a stand-alone system located 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 premises or be grouped with other plaques or directories for other on-site sources.

*Exception: This requirement does not apply where a disconnect in 480.7(A) is not required.*

**Additional Proposed Changes**

| <u>File Name</u> | <u>Description Approved</u> |
|------------------|-----------------------------|
| CN_200.pdf       | 70_CN200                    |

## Statement of Problem and Substantiation for Public Comment

NOTE: This Public Comment appeared as CC Note No. 200 in the First Draft Report on First Revision No. 8089.

The Correlating Committee directs that the panel clarify the panel action on this First Revision relative to the use of "disconnect" in 480.7(F)(1) and (2), Exceptions.

This action will be considered as a public comment.

### Related Item

- First Revision No. 8089

## Submitter Information Verification

**Submitter Full Name:** CC on NEC-AAC

**Organization:** NEC Correlating Committee

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Wed Aug 22 15:16:11 EDT 2018

**Committee:** NEC-P13

## Committee Statement

**Committee Action:** Rejected

**Resolution:** The exceptions are clear as written.



## Correlating Committee Note No. 200-NFPA 70-2018 [ Section No. 480.7 ]

### Submitter Information Verification

**Submitter Full Name:** Erik Hohengasser

**Committee:**

**Submittal Date:** Fri May 11 12:02:44 EDT 2018

### Committee Statement

**Committee Statement:** The Correlating Committee directs that the panel clarify the panel action on this First Revision relative to the use of "disconnect" in 480.7(F)(1) and (2), Exceptions.

This action will be considered as a public comment.

First Revision No. 8089-NFPA 70-2018 [Section No. 480.7]

### Ballot Results

✔ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

12 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

#### Affirmative All

Brunssen, James E.

Dressman, Kevin L.

Hickman, Palmer L.

Hittinger, David L.

Holub, Richard A.

Johnston, Michael J.

Kovacik, John R.

Manche, Alan

McDaniel, Roger D.

Pierce, James F.

Saporita, Vincent J.

Williams, David A.



## Public Comment No. 1965-NFPA 70-2018 [ Section No. 480.7 ]

### 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.

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 for use by first responders.

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 exceeding 240 volts dc nominal between conductors or to ground and subject to field servicing 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) 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.

#### (D) Busway.

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

#### (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) Available fault ~~short-circuit~~ current derived from the stationary battery system
- (3) An arc flash label applied in accordance with acceptable industry practice
- (4) Date the calculation was performed

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

Informational Note No. 2: *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.

#### (F) Identification of Power Sources.

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

##### (1) Facilities with Utility Services and Battery Systems.

Plaques or directories shall be installed in accordance with 705.10 and 712.10(A) .

Exception: ~~This requirement does not apply where a disconnect in 480.7~~

~~(~~

~~A) is not required.~~

##### ~~( 2 )~~ Facilities with Stand-Alone Systems.

~~A permanent plaque or directory shall be installed outside a building or structure supplied by a stand-alone system located 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 premises or be grouped with other plaques or directories for other on-site sources.~~

~~Exception: This requirement does not apply where a disconnect in 480.7(A) is not required in accordance with 710.10.~~

## Statement of Problem and Substantiation for Public Comment

Editorial changes are made to (B) to improve the applicability of this section. The phrase "short-circuit" in (E)(2) should be removed to be consistent with the global changes to "available fault current" as noted in the committee statement. Harmonization changes are made in (F) to prevent potential for duplicative or contradictory marking requirements. The placarding requirements to identify all onsite sources and their disconnecting means should apply to all battery systems regardless of voltage, so the exceptions should be deleted.

### Related Item

- FR-8089

## Submitter Information Verification

**Submitter Full Name:** Jason Fisher

**Organization:** Tesla Inc.

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Thu Aug 30 13:11:45 EDT 2018

**Committee:** NEC-P13

## Committee Statement

**Committee** Rejected but see related SR

**Action:**

**Resolution:** [SR-7721-NFPA 70-2018](#)

**Statement:** The existing informational note that references 240.21(H) is relocated below 480.7(A) for clarity. Editorially a new first level subdivision (B) is created to address requirements for "emergency disconnects" in one and two family dwellings. The term "emergency disconnect" replaces the term "first responder" as it more appropriately addresses the purpose which is to completely disconnect utility power in any type of emergency. New first level subdivision (B) is also modified to clarify that an emergency disconnect is required where a "battery system" is installed. Existing first level subdivisions (B) through (E) are editorially revised to (C) through (G). First level subdivisions (C) and (E) are editorially modified for clarity. Existing informational notes in (F) are relocated below the list items to which they apply. An exception was added for one- and two-family dwellings to address list items (2), (3), and (4). The informational note referencing NFPA 70E is modified for clarity to mirror the informational note in 110.16(B) and the edition was updated. First level subdivision (G) is modified to remove redundant text and a reference to 710.10 is added.



**Public Comment No. 621-NFPA 70-2018 [ Section No. 480.7 ]**

**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) First Responder Disconnect.

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 for use by first responders.

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

(B)

(C) Disconnection of Series Battery Circuits.

Battery circuits 240 volts nominal between conductors or to ground and subject to field servicing 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

D 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.

(

D

E Busway.

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

(

E

F 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) Available

fault short-circuit current

- (1) fault current derived from the stationary battery system
- (2) An arc flash label

applied in accordance with acceptable industry practice

- (1) for selection of PPE and safe work practices
- (2) Date the calculation was performed

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

Informational Note No. 2: 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.

(

F

**G)** Identification of Power Sources.

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

**(1)** Facilities with Utility Services and Battery Systems.

Plaques or directories shall be installed in accordance with 705.10 and 712.10(A).

*Exception: This requirement does not apply where a disconnect in 480.7(A) is not required.*

**(2)** Facilities with Stand-Alone Systems.

A permanent plaque or directory shall be installed outside a building or structure supplied by a stand-alone system located 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 premises or be grouped with other plaques or directories for other on-site sources.

*Exception: This requirement does not apply where a disconnect in 480.7(A) is not required.*

**Additional Proposed Changes**

| <u>File Name</u> | <u>Description</u>    | <u>Approved</u> |
|------------------|-----------------------|-----------------|
| 480.7_Text.docx  | Proposed Revised Text |                 |

**Statement of Problem and Substantiation for Public Comment**

The added text for a first responders disconnecting means should not be confused with the required battery system disconnecting means in 480.7(A). This requirement should be separated from the requirement in 480.7(A) to indicate that this may be in addition to the disconnect required in 480.7(A).. As such the first responder disconnect has been moved to a new 480.7(B) and the following sections renumbered. The informational note has been moved to be under 480.7(A) as this is where it belongs. No other changes to existing text (other than indicated below) were intended as shown in Terra.

In addition, deleted "short circuit" text in 480.7(F)(2) and 480.7(F)(3) was revised to indicate that the arc flash label is for selection of PPE and safe work practices (not just a general arc flash warning label which could be understood given the current wording). Terra shows this revision as sub item (1) and (2) which is in error.

A word document with the proposed changes correctly shown has been attached.

**Related Item**

- FR8089

**Submitter Information Verification**

**Submitter Full Name:** Daniel Neeser  
**Organization:** Eaton's Bussmann Division  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submission Date:** Tue Aug 14 10:38:15 EDT 2018  
**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7721-NFPA 70-2018

**Statement:** The existing informational note that references 240.21(H) is relocated below 480.7(A) for clarity. Editorially a new first level subdivision (B) is created to address requirements for "emergency disconnects" in one and two family dwellings. The term "emergency disconnect" replaces the term "first responder" as it more appropriately addresses the purpose which is to completely disconnect utility power in any type of emergency. New first level subdivision (B) is also modified to clarify that an emergency disconnect is required where a "battery system" is installed. Existing first level subdivisions (B) through (E) are editorially revised to (C) through (G). First level subdivisions (C) and (E) are editorially modified for clarity. Existing informational notes in (F) are relocated below the list items to which they apply. An exception was added for one- and two-family dwellings to address list items (2), (3), and (4). The informational note referencing NFPA 70E is modified for clarity to mirror the informational note in 110.16(B) and the edition was updated. First level subdivision (G) is modified to remove redundant text and a reference to 710.10 is added.



## Public Comment No. 1112-NFPA 70-2018 [ 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 for use by first responders. Where the stationary battery system disconnecting means, or its remote control is not located at the first responder disconnection means location required in 230.85, a sign shall be placed at the first responder disconnecting means location required in 230.85 that indicates the location of the stationary battery system disconnecting means, or its remote control.

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 Comment

The proposed text would enhance safety for first responders that need to remove all sources of power from a premise wiring system by indicating the location of these stationary battery system disconnects. Chapter 17 in NFPA 855 permits storage batteries to be installed in attached garages, detached garages and accessory structures, on exterior walls or concrete pads, or in equipment rooms within the dwelling unit. The disconnect for the battery system and the disconnect required in 230.85 could be located on opposite sides of a structure or on separate structures, this is why signage indicating the exact location of the battery storage system is required at the disconnecting means required in 230.85.

### Related Public Comments for This Document

| <u>Related Comment</u>                                                                       | <u>Relationship</u>                                                                                       |
|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| <a href="#">Public Comment No. 42-NFPA 70-2018</a><br><a href="#">[Section No. 705.10]</a>   | signage requirements for other power source at the first responder disconnecting means required in 230.85 |
| <a href="#">Public Comment No. 1027-NFPA 70-2018</a><br><a href="#">[Section No. 706.15]</a> | signage requirements for other power source at the first responder disconnecting means required in 230.85 |
| <a href="#">Public Comment No. 41-NFPA 70-2018</a><br><a href="#">[Section No. 702.7]</a>    | signage requirements for other power source at the first responder disconnecting means required in 230.85 |

#### Related Item

• FR 8462 NFPA 70-2018 • FR 8089 NFPA 70-2018

### Submitter Information Verification

**Submitter Full Name:** Brian Baughman  
**Organization:** Generac Power Systems Inc  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Thu Aug 23 08:23:03 EDT 2018  
**Committee:** NEC-P13

### Committee Statement

**Committee Action:** Rejected but see related SR

**Resolution:** [SR-7721-NFPA 70-2018](#)

**Statement:** The existing informational note that references 240.21(H) is relocated below 480.7(A) for clarity. Editorially a new first level subdivision (B) is created to address requirements for “emergency disconnects” in one and two family dwellings. The term “emergency disconnect” replaces the term “first responder” as it more appropriately addresses the purpose which is to completely disconnect utility power in any type of emergency. New first level subdivision (B) is also modified to clarify that an emergency disconnect is required where a “battery system” is installed. Existing first level subdivisions (B) through (E) are editorially revised to (C) through (G). First level subdivisions (C) and (E) are editorially modified for clarity. Existing informational notes in (F) are relocated below

the list items to which they apply. An exception was added for one- and two-family dwellings to address list items (2), (3), and (4). The informational note referencing NFPA 70E is modified for clarity to mirror the informational note in 110.16(B) and the edition was updated. First level subdivision (G) is modified to remove redundant text and a reference to 710.10 is added.

#### 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) First Responder Disconnect

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 for use by first responders.

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

##### (~~B~~C) Disconnection of Series Battery Circuits.

Battery circuits 240 volts nominal between conductors or to ground and subject to field servicing 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~~D) 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.

##### (~~D~~E) Busway.

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

##### (~~E~~F) 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) Available fault ~~short-circuit~~ current derived from the stationary battery system
- (3) An arc flash label ~~applied in accordance with acceptable industry practice~~ for selection of PPE and safe work practices
- (4) Date the calculation was performed

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

Informational Note No. 2: *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.

##### (~~F~~G) Identification of Power Sources.

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

##### (1) Facilities with Utility Services and Battery Systems.

Plaques or directories shall be installed in accordance with 705.10 and 712.10(A).

*Exception: This requirement does not apply where a disconnect in 480.7(A) is not required.*

##### (2) Facilities with Stand-Alone Systems.

A permanent plaque or directory shall be installed outside a building or structure supplied by a stand-alone system located 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 premises or be grouped with other plaques or directories for other on-site sources.

*Exception: This requirement does not apply where a disconnect in 480.7(A) is not required.*

**Public Comment No. 1275-NFPA 70-2018 [ 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 for emergency use by first responders. This disconnecting means shall be installed as close as practicable to location of service entrance conductors at the meter location. The disconnect shall be labeled "EMERGENCY DISCONNECT."

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 Comment**

This public input seeks correlation with 230.82 and 230.85.

There are many situations which could necessitate the need for immediate disconnection and the means to disconnect should be labeled as such. The disconnect should also be located as close as practicable to the disconnect required by 230.85.

**Related Item**

- FR 8089

**Submitter Information Verification**

**Submitter Full Name:** James Dollard

**Organization:** IBEW Local Union 98

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Sat Aug 25 10:22:21 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7721-NFPA 70-2018

**Statement:** The existing informational note that references 240.21(H) is relocated below 480.7(A) for clarity. Editorially a new first level subdivision (B) is created to address requirements for "emergency disconnects" in one and two family dwellings. The term "emergency disconnect" replaces the term "first responder" as it more appropriately addresses the purpose which is to completely disconnect utility power in any type of emergency. New first level subdivision (B) is also modified to clarify that an emergency disconnect is required where a "battery system" is installed. Existing first level subdivisions (B) through (E) are editorially revised to (C) through (G). First level subdivisions (C) and (E) are editorially modified for clarity. Existing informational notes in (F) are relocated below the list items to which they apply. An exception was added for one- and two-family dwellings to address list items (2), (3), and (4). The informational note referencing NFPA 70E is modified for clarity to mirror the informational note in 110.16(B) and the edition was updated. First level subdivision (G) is modified to remove redundant text and a reference to 710.10 is added.



## Public Comment No. 1028-NFPA 70-2018 [ Section No. 480.10 ]

### 480.10 Battery Locations.

Battery locations shall conform to 480.10(A), (B), and (C).

#### (A) Ventilation.

Provisions appropriate to the battery technology shall be made for sufficient diffusion and ventilation of gases from the battery, if present, to prevent the accumulation of an explosive mixture.

Informational Note No. 1: See NFPA 1-2015, *Fire Code*, Chapter 52, for ventilation considerations for specific battery chemistries.

Informational Note No. 2: Some battery technologies do not require ventilation.

Informational Note No. 3: For additional information on the ventilation of stationary battery systems, see *IEEE Std 1635-2012/ASHRAE Guideline 21-2012 Guide for the Ventilation and Thermal Management of Batteries for Stationary Applications*.

#### (B) Live Parts.

Guarding of live parts shall comply with 110.27.

#### (C) Spaces About Battery Systems.

Spaces about battery systems shall comply with 110.26. Working space shall be measured from the edge of the battery cabinet, 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. Battery stands 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.

Informational Note: Additional space is often needed to accommodate battery hoisting equipment, tray removal, or spill containment.

#### (D) Top Terminal Batteries.

Where top terminal batteries are installed on tiered racks or on shelves of battery cabinets, working space in accordance with the battery manufacturer's instructions shall be provided between the highest point on a cell and the row, shelf, or ceiling above that point.

Informational Note: IEEE 1187-2013, *IEEE Recommended Practice for Installation Design and Installation of Valve-Regulated Lead-Acid Batteries for Stationary Applications*, provides guidance for top clearance of valve-regulated lead-acid batteries, which are commonly used in battery cabinets.

#### (E) Egress.

~~A personnel~~ For other than one- and two-family dwelling units, ~~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 hardware.

#### (F) Piping in Battery Rooms.

Gas piping shall not be permitted in dedicated battery rooms.

#### (G) Illumination.

Illumination shall be provided for working spaces containing battery systems. The lighting outlets shall not be controlled by automatic means only. Additional lighting outlets shall not be required where the work space is illuminated by an adjacent light source. The location of luminaires shall not:

- (1) Expose personnel to energized battery components while performing maintenance on the luminaires in the battery space; or
- (2) Create a hazard to the battery upon failure of the luminaire.

## Statement of Problem and Substantiation for Public Comment

The language provides correlation with Chapter 17 of NFPA 855. NFPA 855 permits a residential ESS to be installed in an attached or detached garages or accessory structures, or within utility closets and storage or utility spaces. The language would provide relief that listed panic hardware and doors opening into the path of egress is not required for one- and two-family dwelling units.

### Related Item

- First Revision No. 149-NFPA 855-2017 [ Global Input ]

### Submitter Information Verification

**Submitter Full Name:** Brian Baughman

**Organization:** Generac Power Systems Inc

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Wed Aug 22 08:16:34 EDT 2018

**Committee:** NEC-P13

### Committee Statement

**Committee Action:** Rejected

**Resolution:** The submitter referenced an FR for NFPA 855 not NFPA 70. NFPA 855 is not a published standard.

**Public Comment No. 615-NFPA 70-2018 [ Section No. 480.10(C) ]****(C)** Spaces About Battery Systems.

Spaces about battery systems shall comply with 110.26 and 110.34 . Working space shall be measured from the edge of the battery cabinet, 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. Battery stands 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.

Informational Note: Additional space is often needed to accommodate battery hoisting equipment, tray removal, or spill containment.

**Statement of Problem and Substantiation for Public Comment**

The requirements of 480.10(C) need to be expanded to include 110.34 in addition to 110.26 in order to include battery systems greater than 1000V and align with the changes made in 706.20(C)(1) in FR 8944.

**Related Item**

- FR8944

**Submitter Information Verification**

**Submitter Full Name:** Daniel Neeser

**Organization:** Eaton's Bussmann Division

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Tue Aug 14 09:45:11 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Accepted

**Resolution:** [SR-7719-NFPA 70-2018](#)

**Statement:** The requirements of 480.10(C) are expanded to include 110.34 in addition to 110.26 in order to cover battery systems greater than 1000V and align with the changes made in 706.20(C)(1) in FR 8944.

**Public Comment No. 183-NFPA 70-2018 [ Section No. 480.10(E) ]**

(E) Egress.

A ~~personnel door(s)~~ Personnel doors 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 listed fire exit hardware.

**Statement of Problem and Substantiation for Public Comment**

This public comment is submitted on behalf of a task group appointed by the NEC Correlating Committee. The members of the Task Group are David Hittinger, John Kovacik, and Robert Osborne. The task group was appointed to identify areas in the Code® where “listed panic hardware” is required to expand the requirement to address both “listed panic hardware” and “listed fire exit hardware” as both types of hardware are evaluated to the Standard for Panic Hardware, UL 305, with “listed fire exit hardware” evaluated to both UL 305 AND the Standard for Positive Pressure Fire Tests of Door Assemblies, UL 10C. This action is taken to ensure consistency throughout the Code® where “panic hardware” is specified. Other changes to the verbiage may be included with the specific Public Comment, with the goal of establishing consistency with how these requirements are stated. Changes to Section 110.26(C)(3), as detailed in FR 8658, serve as the template for these revisions.

**Related Item**

- FR 8658

**Submitter Information Verification**

**Submitter Full Name:** Robert Osborne

**Organization:** UL LLC

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Mon Jul 09 09:15:04 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Accepted

**Resolution:** SR-7714-NFPA 70-2018

**Statement:** The requirement is expanded to address both “listed panic hardware” and “listed fire exit hardware” as both types of hardware are evaluated to the Standard for Panic Hardware, UL 305, with “listed fire exit hardware” evaluated to both UL 305 and the Standard for Positive Pressure Fire Tests of Door Assemblies, UL 10C.

**Public Comment No. 1122-NFPA 70-2018 [ Section No. 695.3(C)(3) ]****(3) Selective Coordination.**

~~The overcurrent~~ Overcurrent protective device(s) ~~in each disconnecting means shall~~ shall be selectively coordinated with 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, maintain, and operate the system.

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 Comment**

The text as proposed implies that only overcurrent devices associated with disconnecting means would require coordination. It is quite possible (particularly in larger systems) that overcurrent protection would be provided by protective relays or other listed overcurrent protection devices which provide required protection. The suggested changes remove that potential issue.

**Related Item**

- 7729

**Submitter Information Verification**

**Submitter Full Name:** Gary Olson

**Organization:** Kw Rx Llc

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Thu Aug 23 10:57:29 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** [SR-7526-NFPA 70-2018](#)

**Statement:** This revision clarifies that the selective coordination requirements of this section apply to any overcurrent protective devices supplying a fire pump. In order to correlate with similar requirements, the last sentence regarding selective coordination of overcurrent devices in series was revised as an exception to the main requirement.

**Public Comment No. 622-NFPA 70-2018 [ Section No. 695.3(C)(3) ]****(3)** Selective Coordination.

The overcurrent protective device(s) in each disconnecting means shall be selectively coordinated with 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, 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 Comment**

The last sentence was revised to add "Exception:" to correlate with other sections that show this as an exception, such as 700.32.

**Related Item**

- FR7729

**Submitter Information Verification**

**Submitter Full Name:** Daniel Neeser

**Organization:** Eaton's Bussmann Division

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Tue Aug 14 10:49:45 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:**

**Resolution:** [SR-7526-NFPA 70-2018](#)

**Statement:** This revision clarifies that the selective coordination requirements of this section apply to any overcurrent protective devices supplying a fire pump. In order to correlate with similar requirements, the last sentence regarding selective coordination of overcurrent devices in series was revised as an exception to the main requirement.



## Public Comment No. 1343-NFPA 70-2018 [ Section No. 695.6(A) ]

### (A) Supply Conductors.

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

(a) 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).

(b) It shall be permitted to omit the ground conductor.

*Exception: The supply conductors within the fire pump room shall not be required to meet 230.6(1) or (2).*

Informational Note: See 250.24(C) for routing the grounded conductor to the service equipment.

#### (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:

- (1) *Independent Routing.* The conductors shall be kept entirely independent of all other wiring.
- (2) *Associated Fire Pump Loads.* The conductors shall supply only loads that are directly associated with the fire pump system.
- (3) *Protection from Potential Damage.* The conductors shall be protected from potential damage by fire, structural failure, or operational accident.
- (4) *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:
  - a. The cable or raceway is encased in a minimum 50 mm (2 in.) of concrete.
  - b. The cable or raceway is a listed fire-resistive cable system.

Informational Note No. 1: Fire-resistive cables are tested to ANSI/UL 2196-2017, *Standard for Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables*.

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

- c. The cable or raceway is a listed electrical circuit protective system.

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

*Exception to 695.6(A)(2)(4): 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 Comment

Regarding the proposed language in Resolved PI 262 to permit omitting the ground conductor, NFPA 70 requires the grounded conductor (NEC 250.24(C)) to be grounded only in the service equipment. However, for fire pump controllers, when the ground conductor is not the grounded service conductor, it is not required to be routed to the fire pump controller since the fire pump loads are 3-wire loads not requiring a ground conductor

### Related Item

- PI 262

## Submitter Information Verification

**Submitter Full Name:** Vince Baclawski

**Organization:** Nema

**Street Address:**

**City:**

**State:**

**Zip:****Submittal Date:** Mon Aug 27 11:36:43 EDT 2018**Committee:** NEC-P13**Committee Statement****Committee** Rejected**Action:****Resolution:** Fundamental electrical safety requires an appropriate fault return path for system ground faults. The grounded conductor or supply side bonding jumper as applicable to the installation must be provided to the fire pump to provide a ground fault return path.

**Public Comment No. 227-NFPA 70-2018 [ 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 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).

*Exception: The supply conductors within the fire pump room shall not be required to meet 230.6(1) or (2).*

*Informational Note: See 250.24(C) for routing the grounded conductor to the service equipment.*

**Statement of Problem and Substantiation for Public Comment**

This new exception will add confusion to Code users and enforcement and possible correlation issues with Article 230.

The reason for the exception is to allow service conductors to be installed in fire pump rooms without concrete encasement. The reasoning is based on the fire pump room having a 2-hour fire rating and sprinkler protection.

Section 695.6(A) allows fire pumps to be supplied by service conductors provided the service conductors are physically routed outside the building and be installed in accordance with 230.6, 230.9, and Parts III and IV of Article 230. Fire rating is not a requirement of Article 230. The confusion will come into play with the requirement of 230.70(A)(1) which states the service disconnecting means shall be located inside nearest the point of entrance of the service conductors.

Section 230.70 is concerned about the protection of property and personnel from service conductors. If the service conductors have a ground fault or short circuit the overcurrent protective device on the primary side of the utility transformer must clear the fault. There is no exception for concrete encasement under 230.70 for electrical rooms which may have a 2-hour fire rating.

In the substantiation for PI 1446 the submitter stated he had to run conduit about 20 feet across the fire pump room to the fire pump controller because the engineer changed the equipment layout. The inspector would not allow it because it was a violation of 230.70(A)(1). With this new exception will it be OK to run an unlimited amount of service conductors in a building's fire pump room?

**Related Item**

- FR 7730

**Submitter Information Verification**

**Submitter Full Name:** David Hittinger

**Organization:** IEC

**Affiliation:** Independent Electrical Contractrs, Inc.

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Mon Jul 16 15:42:24 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected

**Resolution:** Fire pump rooms are required to have a 2-hour fire rating or a fire suppression system. Service conductors in fire pump rooms are typically designed to directly enter the fire pump controller. The small size of typical fire pump rooms preclude long runs of service conductors within the room. Article 230 requires that the service disconnect means be installed nearest the point of entrance of the service conductors.

**Public Comment No. 1345-NFPA 70-2018 [ Section No. 695.6(J) ]****(J) Terminations.**

Where raceways or cable are terminated at a fire pump controller, the following requirements shall be met: ~~Listed raceway-~~ [20:9.9]

- (1) Raceway or cable fittings listed and identified for use in wet locations shall be used. [20:9.9.1]
- (2) The type rating of the raceway 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 raceway or cable terminations 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 Comment**

Fittings for dry locations do not provide the necessary protection against ingress of dripping water as the minimum environmental rating for a fire pump controller enclosure is Type 2. Fittings listed and marked for use in wet locations according to ANSI/UL 514B (see Annex A) adequately provides this protection.

Additionally, the references to corresponding parts of NFPA 20 should be retained. While the corresponding NFPA 20 text is not identical to the NEC in this section, the intent is the same and such references make the Code more user-friendly

**Related Item**

- FR 7679

**Submitter Information Verification**

**Submitter Full Name:** Vince Baclawski

**Organization:** Nema

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Mon Aug 27 11:41:15 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7534-NFPA 70-2018

**Statement:** These revisions provide better alignment with current NEC requirements and are not in conflict with present requirements in NFPA 20.

Extract references are removed as editorial revisions in NFPA 20 are necessary.



## Public Comment No. 983-NFPA 70-2018 [ Section No. 695.10 ]

### 695.10 Listed Equipment.

Diesel engine fire pump controllers, electric fire pump controllers, electric motors, fire pump power transfer switches, foam pump controllers, and limited service controllers shall be listed for fire pump service. [20:9.5.1.1, 10.1.2.1, 12.1.3.1]

Fire pump controllers and transfer switches shall not be permitted to be reconditioned.

## Additional Proposed Changes

### File Name

### Description Approved

NEMA-Position\_Refubishing\_on\_ElecEquip.pdf

## Statement of Problem and Substantiation for Public Comment

This public comment is submitted by an NEC Correlating Committee appointed task group to address the global impacts of PI 2935. This PI would have required that "Reconditioned Equipment" be "listed as "reconditioned" and the "original listing marks removed". This PI has ramifications that are global in nature and impacts all products referenced in the NEC under the purview of every CMP.

This proposed new section is safety-driven and is necessary to prevent the reconditioning of products that cannot be reconditioned.

This public comment is based on the global impact of public input 2935 and does not represent new material.

The "NEMA Policy on Reconditioned Electrical Equipment" is attached to this public comment. See also global public comment 979.

The substantiation for global public comment 979 is provided below:

Public Comment No. 979-NFPA 70-2018 [Global Input]

This Public Comment is submitted on behalf of a task group appointed by the NEC® Correlating Committee. This Task Group was appointed to review the use of refurbished equipment throughout the NEC®. Task Group members are Jim Dollard, Robert Osborne, Jim Pierce, and David Williams. This task group has been charged with reviewing Public Input (PI) 2935 which was resolved by CMP-1 during the first draft stage. This PI would have required that "Reconditioned Equipment" be "listed as "reconditioned" and the "original listing marks removed". This PI has ramifications that are global in nature and impacts all products referenced in the NEC under the purview of every CMP.

Task group members noted that some types of equipment are capable of being reconditioned, then re-evaluated to ensure compliance with the applicable product standards. Other types of equipment do not lend themselves to reconditioning due to the complexity of the product, the manufacturing process, or the level of knowledge the company performing the reconditioning may need, etc.

The "NEMA Policy on Reconditioned Electrical Equipment" details the following aspects of Reconditioning of Electrical Equipment:

- Fundamental Tenets for Reconditioning Electrical Equipment
- Electrical Infrastructure and Worker Safety
- Integrity of Reconditioned Equipment
- Listing or Certification Marks
- UL Guidance on the UL Mark
- Components or Assemblies Not Suitable For Reconditioning (Appendix A)
- Components or Assemblies Which May Be Reconditioned (Appendix B)

A PDF copy of this NEMA policy is attached and may also be found on the internet at the following URL:  
[https://www.nema.org/Policy/Documents/NEMA-Position\\_Refubishing%20on%20ElecEquip.pdf](https://www.nema.org/Policy/Documents/NEMA-Position_Refubishing%20on%20ElecEquip.pdf)

NEC® Section 110.21(A)(2), which was new for the 2017 Edition of the NEC®, included marking requirements for "Reconditioned Equipment". PI 2935 would have required that "Reconditioned Equipment" be "listed as "reconditioned" and the "original listing marks removed". CMP 1 resolved this PI. This Task Group appointed by the NEC® Correlating Committee has developed a number of public comments, based on the products identified in the referenced NEMA document, to determine whether or not equipment can be reconditioned, and if reconditioned, what additional requirements apply.

While several public comments were developed for specific equipment by this task group, not all equipment was addressed

(neither was all the equipment noted in the NEMA Policy document addressed). This Global Public Comment requests each CMP to review the products required to be listed under their purview and determine whether reconditioning should be permitted. It is recommended that the NEMA Policy document be used as one of the guidelines in making this determination. It is also recommended that one of the following options/examples be chosen for listed equipment:

**Option 1 - Equipment NOT suitable for Reconditioning (EXAMPLE):**

695.10 Listed Equipment. Diesel engine fire pump controllers, electric fire pump controllers, electric motors, fire pump power transfer switches, foam pump controllers, and limited service controllers shall be listed for fire pump service. [20:9.5.1.1, 10.1.2.1, 12.1.3.1]

Fire pump controllers and transfer switches shall not be permitted to be reconditioned.

**Option 2 - Equipment which MAY BE suitable for Reconditioning (EXAMPLE):**

408.8 Reconditioned Equipment.

(A) Panelboards. The use of reconditioned panelboards shall comply with (1) and (2):

(1) Industrial and commercial panelboards shall be permitted to be reconditioned. Reconditioned equipment shall be listed as "reconditioned" and the original listing mark removed.

(2) Panelboards installed in dwelling units shall not be permitted to be reconditioned.

(B) Switchboards and Switchgear. Low voltage switchgear, medium voltage switchgear and switchboards shall be permitted to be reconditioned. Reconditioned equipment shall be listed as "reconditioned" and the original listing mark removed.

Note that equipment where no specific guidance is provided would be permitted to be reconditioned and would only be required to meet the marking requirements in 110.21(A)(2).

## Related Public Comments for This Document

| <u>Related Comment</u>                                                             | <u>Relationship</u> |
|------------------------------------------------------------------------------------|---------------------|
| <a href="#">Public Comment No. 979-NFPA 70-2018 [Global Input]</a>                 |                     |
| <a href="#">Public Comment No. 980-NFPA 70-2018 [New Section after 240.87(B)]</a>  |                     |
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| <a href="#">Public Comment No. 984-NFPA 70-2018 [Section No. 700.5(C)]</a>         |                     |
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| <a href="#">Public Comment No. 987-NFPA 70-2018 [New Section after 408.7]</a>      |                     |

**Related Item**

- PI 2935

## Submitter Information Verification

**Submitter Full Name:** James Dollard

**Organization:** IBEW Local Union 98

**Street Address:**

**City:**

**State:**

**Zip:**

**Submission Date:** Tue Aug 21 09:17:30 EDT 2018

**Committee:** NEC-P13

## Committee Statement

**Committee** Rejected but see related SR

**Action:**

**Resolution:** [SR-7522-NFPA 70-2018](#)

**Statement:** This second revision is safety-driven and is necessary to prevent the reconditioning of products (automatic transfer switches) that cannot be reconditioned. This public comment is based on the global impact of public input 2935 which has ramifications that are global in nature and impacts all products referenced in the NEC under the purview of every CMP and does not represent new material. See the "NEMA Policy on Reconditioned Electrical Equipment." Some types of equipment are capable of being reconditioned, then re-evaluated to ensure compliance with the applicable product standards. Other types of equipment (automatic transfer switches) do not lend themselves to reconditioning due to the complexity of the product, the manufacturing process, or the level of knowledge the company performing the reconditioning may need, etc.

# **NEMA Policy on Reconditioned Electrical Equipment**

## **Executive Summary:**

The option of reconditioning existing equipment (instead of purchasing new equipment) exists today. Proper electrical equipment reconditioning provides a means to extend the life of electrical products as well as an opportunity in some cases to update installed equipment with the latest performance and safety features. However, not all components of the electrical infrastructure are candidates for reconditioning.

There are a number of precautions that must be adhered to when reconditioning electrical equipment if that equipment is to operate safely and with acceptable performance. Those precautions are discussed below and include the use of design qualified parts, testing to industry-recognized safety standards, original manufacturer specification and/or recommendations, when possible, and reconditioning performed by qualified personnel. The integrity of reconditioned electrical equipment must be established by documenting and demonstrating that component replacement has not compromised the manufacturer's original specifications and accepted industry standards.

The third party certification mark must be removed or obliterated from reconditioned electrical products to indicate that an evaluation of the reconditioning process or reconditioned product has not been conducted by the original third party.

As guidance, Appendix B provides a list of electrical products and components that are considered by NEMA suitable for reconditioning and Appendix A provides a list of electrical products considered not suitable for reconditioning. Medical Imaging Equipment is specifically not addressed by this policy (reference MITA 1, Good Refurbishment Practices for Medical Imaging Equipment).

## **Introduction:**

The U.S. electrical industry includes discussions on implementing new technologies to enhance existing electrical infrastructure. Further, sustainability and safeguarding the environment are growing in importance. In the midst of this is the option for reconditioning existing equipment. Paramount in all this is the fundamental priority that all electrical systems operate while safe-guarding personnel and infrastructure from potential hazards (electrical, mechanical, fire, etc.). This forms the basis for the NEMA position on reconditioning electrical products.

Given that electrical systems are diverse in design, function, and application, not all components of the electrical infrastructure are candidates for reconditioning.

## **Definition:**

Reconditioning: the process of restoring electromechanical systems, equipment, apparatus or components to operating conditions as recommended by the

manufacturer's instructions, using only design qualified parts. Reverse engineered parts (designs copied from existing parts by other manufacturers) are not considered to be "design qualified parts" unless specifically design verified under applicable Standards. Electrical industry practitioners and other organizations may also use the following terms/words to describe the process of reconditioning: remanufacturing, refurbishing, recycling, repairing, restoring, rebuilding, reengineering, and reusing.

In addition to design considerations, it is often impossible to obtain the service records, application environment, and operation parameters of all electrical components. Not having access to such information could have an adverse impact on the final safety and reliability of refurbished or reconditioned equipment. While NEMA supports the reconditioning of some electrical equipment, the components listed in Appendix A are not recommended for reconditioning, unless otherwise indicated by the original manufacturer. Normal servicing of equipment that remains within a facility should not be considered reconditioning or refurbishing. For electrical components suitable for reconditioning listed in Appendix B, the following fundamental tenets have been established.

### **Fundamental Tenets for Reconditioning Electrical Equipment**

- Reconditioning electrical equipment may be a viable option for extending operational lifetime of equipment and enhancing equipment with additional features.
- Electrical equipment reconditioning activity must be based on available guidance documentation from the Original Equipment Manufacturer, or industry-developed standards. Where any conflict in guidance is noted between the OEM and industry standards, the OEM guidance should take precedence.
- Electrical equipment must be reconditioned and qualified to an industry-developed standard that ensures equipment is in a usable and safe operating condition. An industry-developed standard is a widely agreed upon rule, set of rules, procedures or requirements for a product, assembly or process which are developed by members or organizations of an aggregate of manufacturing and technically productive enterprises in a particular field. Products deemed to be candidates for reconditioning must be reconditioned and qualified to industry standards containing the most relevant and critical design aspects, testing criteria and manufacturing specifications when the item was built.
- Reconditioning work must be performed by qualified personnel.
- Electrical equipment that has been exposed to adverse conditions, such as fire, water damage, etc., may not be suitable for reconditioning.
- A comprehensive assessment of the electrical equipment being considered for reconditioning with service records, application, environment, service life, and operating parameters is critical before deciding to pursue reconditioning of the electrical equipment and system. Trained, skilled technicians should be able to assess whether a device or system is suitable for reconditioning through physical inspection and test.
- Appendix A provides guidance on which components or assemblies of the electrical system are not suitable for reconditioning because they may pose a

hazard. Appendix B provides guidance on the components or assemblies are suitable for reconditioning.

- Reconditioning electrical equipment must utilize electrical product safety standards as they contain design aspects, testing criteria and manufacturing specifications to ensure a given product will function as intended. These requirements are established to deliver a usable and safe operating condition as a key component of intended product functionality.

## **Electrical Infrastructure and Worker Safety**

Electrical equipment that is properly installed, tested, maintained, and operated will provide reliable power as well as protect the electrical infrastructure. The reconditioning of electrical equipment requires the electrical industry, in collaboration with manufacturers, to establish performance specifications and accepted industry standards to help ensure safe and reliable equipment that help protect our electrical infrastructure so workers and users can continue to benefit from a safe and effective electrical system. Reconditioning standards must include prescriptive actions and performance requirements that result in equipment that complies with standards that include but are not limited to CSA, IEC, IEEE, NEC, OSHA, NFPA 70E, NFPA 70B, NETA ATS, NETA MTS, and EASA AR100 for example. Qualified personnel must possess the knowledge of how to assess equipment condition, potential hazards, and specifications to accurately determine the suitability for reconditioning. A safe and reliable electrical infrastructure that can be safely maintained is dependent on compliance with manufacturers' instructions, qualified workers, proper maintenance, and accepted industry standards for reconditioning activities.

## **Electrical Equipment Reliability, Performance and Safety**

Proper electrical equipment reconditioning provides a means to extend the life of electrical products as well as an opportunity to update installed equipment with the latest performance and safety features. Establishing well defined guidelines for those performing the reconditioning activity, based on original manufacturer's requirements, creates a solid foundation for the electrical industry and users. It is paramount that reconditioned electrical equipment be reliable in not only providing power, but also in safely performing its intended function as part of a safe operating electrical system. Understanding the environment, electrical load characteristics and historical maintenance performed on equipment being considered for reconditioning are all important parts of an assessment for reconditioning that can have a significant bearing on reliability, performance and safety. The electrical equipment manufacturer is the foremost authority on the design, performance and intended safe application of their product. Reconditioned electrical equipment must not compromise the reliability, performance, safe operation, or maintenance of the electrical system.

## **Integrity of Reconditioned Equipment**

Reconditioned electrical equipment must comply with all applicable standards at the time the equipment was initially built as a minimum as well as the original manufacturer's performance requirements in accordance with the nameplate markings and ratings. Replacement parts shall meet the design criteria (form, fit, and function) for the device to perform its intended function and provide safe operation. Replacement parts shall not include counterfeit parts (i.e., parts that have been misrepresented to be an authorized item of the legally authorized source.) Equipment shall operate safely in its intended application after reconditioning occurs. Care must be taken to ensure specific operations such as timing, sequencing, control, transfer, etc. continue to function in the manner originally intended, unless changes are specified during the reconditioning process. The integrity of reconditioned electrical equipment must be established by documenting and demonstrating that component replacement and performance changes have not compromised the manufacturer's specifications and accepted industry standards.

### **Listing or Certification Marks**

NEMA members manufacture products that are more than likely to be evaluated as part of a third party certification program to nationally recognized safety standards. These products can be marked with a listing or certification mark when the products are manufactured and shipped from the factory. The organization that reconditions the product is responsible for adhering to the guidelines from the issuing agency authorizing the mark to determine if the mark can remain on the product after reconditioning. The organization that reconditions is responsible for any actions necessary for the mark to remain on the product (analysis, testing, etc.). Otherwise, reconditioned electrical products must have their mark removed or obliterated to indicate that an evaluation of the reconditioning process has not been conducted by the original third party.

The organization that reconditions the product is additionally responsible for applying a mark or seal that indicates that the equipment has been reconditioned. This mark must provide traceability to the reconditioning organization in the event that it is necessary to determine the details of who reconditioned the equipment and the report on what was completed during this process.

There are a number of NEMA products that are not allowed to be reconditioned due to the inherent safety characteristics and requirements for those products to be evaluated according to a regular follow up program to evaluate the safety performance requirements as a condition of maintaining the listing or certification mark. This process cannot be applied to reconditioned electrical products since these are normally destructive tests and sample sets of reconditioned products are not possible due to limited quantities or ratings of specific devices.

### **UL Guidance on the UL Mark**

When the manufacturer places the UL Mark on the product at the factory, it is their attestation that the product complies with the applicable requirements. Unless there is further oversight or review/inspection (field inspection) UL cannot ascertain that the

product continues to comply with all requirements should field repairs, modifications or component replacements be made to the product.

Obviously there is little control over what manufacturers will or can do to equipment which left the factory with a certification mark. UL has created rebuilt categories where the reconditioning of product is done in an organized consistent manner under the supervision of UL's FUS (Follow-Up Services) field representatives. In these cases the first action conducted with equipment being rebuilt is the removal of the initial certification mark (if provided). Upon completion of the reconditioning, in accordance with the surveillance document, the manufacturer is permitted to affix a mark which clearly identifies the product as reconditioned.

Cases where a reconditioner is instructed to NOT remove any certification mark will result in confusion. Clearly such equipment in the field, which has undergone modification or reconditioning, is ineligible to bear a mark which designates a compliance with a certification standard.

# APPENDIX A

## COMPONENTS OR ASSEMBLIES NOT SUITABLE FOR RECONDITIONING\*

Adjustable speed drives  
Arc fault circuit breakers  
Ballasts  
Busway (mylar wrapped)  
Busway (powder coated)  
Cable tray  
Cast resin transformers  
Components containing semiconductors and transistors  
Control transformers  
Dry type transformers  
Electrical Connectors  
Electrical submetering equipment  
Electrical vehicle supply equipment  
Enclosed switches  
Fire detectors, smoke alarms, co detectors  
Fire pump controllers  
Flexible and extension cords  
Flexible conduit  
Ground fault circuit breakers  
High performance wire and cable  
Lighting controls  
Liquid filled transformers  
Low and medium voltage fuse holders  
Low and medium voltage non-renewable fuses  
Low voltage power circuit breaker electronic trip units  
Luminaires  
Meters (electromechanical, electronic or digital)  
Meter sockets  
Molded case circuit breakers  
Non-Metallic conduit, tubing, raceways and fittings  
Non-metallic surface raceways and fittings  
Outlet and junction boxes  
Overload relays  
Pin and sleeve plugs receptacles and connectors  
Power and control cable  
Protective relays (electronic or digital)  
Residential panel boards  
Solid state contactors and starters  
Solid state drives  
Strut type channel raceway  
Surface metal raceways and fittings  
Surge protective devices  
Transfer switches  
Wire or cable  
Wireway  
Wiring devices

\*The components or products listed above are not recommended for reconditioning, unless otherwise indicated by the original manufacturer.

## **APPENDIX B**

### **COMPONENTS OR ASSEMBLIES WHICH MAY BE RECONDITIONED**

Electromechanical protective relays, and current transformers

High voltage circuit breakers

Industrial and commercial panel boards

Low and medium voltage power circuit breakers

Low and medium voltage replaceable link fuses

Low voltage switchgear

Manual and magnetic controllers

Medium voltage switchgear

Metallic conduit, tubing, raceways and fittings

Motor control centers

Motors

Switchboards

Uninterruptible Power Supply Equipment

**Public Comment No. 1332-NFPA 70-2018 [ 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. ~~remote start circuit shall be monitored for broken, disconnected, or shorted wires . 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 20-2016, *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. 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 No. 1: Fire-resistive cables are tested to ANSI/UL 2196-2017, *Standard for Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables*, 2017 edition.

Informational Note No. 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 protected by a listed electrical circuit protective system.

Informational Note No. 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 No. 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 Comment**

CMP-13 did a lot of work in the first draft meeting to properly fix the generator start circuit articles (700.10(D)(3) and 695.14(F)). The first revision report properly reflects our work for 700.10(D)(3), but failed to reflect the work for 695.14(F).

This Public Comment corrects the error, so that the 695.14(F) wording is per the outcome of the CMP-13 first draft panel meeting (and exactly matches TIA 1357, which was issued on 8-14-18).

**Related Item**

- PI 3466

**Submitter Information Verification**

**Submitter Full Name:** Timothy Windey  
**Organization:** Cummins Power Generation  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Mon Aug 27 10:39:21 EDT 2018  
**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR  
**Resolution:** [SR-7523-NFPA 70-2018](#)  
**Statement:** This revision aligns the generator control wiring start circuit requirements for fire pumps with the 2017 NEC TIA 1357 and section 700.10(D)(3).

**Public Comment No. 1317-NFPA 70-2018 [ Section No. 700.4(B) ]**

(B) Capacity.

An

An emergency system shall have adequate capacity

~~in accordance with Article 220.~~

and rating for all loads to be operated simulataneously.

**Statement of Problem and Substantiation for Public Comment**

The first sentence of the 2017 NEC should be put back. The statements below have been taken from literature provided by major generator manufacturers.

"Diesel engines can suffer damage as a result of misapplication or misuse - namely internal glazing and carbon buildup. This is a common problem in generator sets caused by failure to follow application and operating guidelines - ideally diesel engines should run at least around 60-75% of their maximum rated load."

"Operating a diesel generator set at load levels less than 30 percent of rated output for extended time periods impacts the unit negatively. "

It is important to understand that generator sets are designed to run and, to be specific, they are designed to run with load. This may seem trivial, but loading a generator set properly is essential to availability, healthy engine operation and long engine life.

Requiring generators to be sized by Article 220 can be misused and lead to oversizing. Lighting is required to be sized by table 220.12 which requires unit loads. Receptacles used in health care have no demand factors. Typical sizing of loads using Article 220 can lead to oversizing of genset by 70%.

**Related Item**

- FR-7505

**Submitter Information Verification**

**Submitter Full Name:** David Hittinger

**Organization:** IEC

**Affiliation:** Independent Electrical Contractors Inc.

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Sun Aug 26 22:34:22 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7665-NFPA 70-2018

**Statement:** This second revision recognizes that calculations are permitted to be made in accordance with Article 220 or by another approved method.



## Public Comment No. 984-NFPA 70-2018 [ Section No. 700.5(C) ]

### (C) Automatic Transfer Switches.

Automatic transfer switches shall be electrically operated and mechanically held. Automatic transfer switches shall not be permitted to be reconditioned.

## Additional Proposed Changes

### File Name

### Description Approved

NEMA-Position\_Refubishing\_on\_ElecEquip.pdf

## Statement of Problem and Substantiation for Public Comment

This public comment is submitted by an NEC Correlating Committee appointed task group to address the global impacts of PI 2935. This PI would have required that "Reconditioned Equipment" be "listed as "reconditioned" and the "original listing marks removed". This PI has ramifications that are global in nature and impacts all products referenced in the NEC under the purview of every CMP.

This proposed new section is safety-driven and is necessary to prevent the reconditioning of products that cannot be reconditioned.

This public comment is based on the global impact of public input 2935 and does not represent new material.

The "NEMA Policy on Reconditioned Electrical Equipment" is attached to this public comment. See also global public comment 979.

The substantiation for global public comment 979 is provided below:

Public Comment No. 979-NFPA 70-2018 [Global Input]

This Public Comment is submitted on behalf of a task group appointed by the NEC® Correlating Committee. This Task Group was appointed to review the use of refurbished equipment throughout the NEC®. Task Group members are Jim Dollard, Robert Osborne, Jim Pierce, and David Williams. This task group has been charged with reviewing Public Input (PI) 2935 which was resolved by CMP-1 during the first draft stage. This PI would have required that "Reconditioned Equipment" be "listed as "reconditioned" and the "original listing marks removed". This PI has ramifications that are global in nature and impacts all products referenced in the NEC under the purview of every CMP.

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[https://www.nema.org/Policy/Documents/NEMA-Position\\_Refubishing%20on%20ElecEquip.pdf](https://www.nema.org/Policy/Documents/NEMA-Position_Refubishing%20on%20ElecEquip.pdf)

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permitted. It is recommended that the NEMA Policy document be used as one of the guidelines in making this determination. It is also recommended that one of the following options/examples be chosen for listed equipment:

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408.8 Reconditioned Equipment.

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(1) Industrial and commercial panelboards shall be permitted to be reconditioned. Reconditioned equipment shall be listed as "reconditioned" and the original listing mark removed.

(2) Panelboards installed in dwelling units shall not be permitted to be reconditioned.

(B) Switchboards and Switchgear. Low voltage switchgear, medium voltage switchgear and switchboards shall be permitted to be reconditioned. Reconditioned equipment shall be listed as "reconditioned" and the original listing mark removed.

Note that equipment where no specific guidance is provided would be permitted to be reconditioned and would only be required to meet the marking requirements in 110.21(A)(2).

## Related Public Comments for This Document

| <u>Related Comment</u>                                                             | <u>Relationship</u> |
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| <a href="#">Public Comment No. 983-NFPA 70-2018 [Section No. 695.10]</a>           |                     |
| <a href="#">Public Comment No. 985-NFPA 70-2018 [Section No. 701.5(C)]</a>         |                     |
| <a href="#">Public Comment No. 986-NFPA 70-2018 [Section No. 702.5]</a>            |                     |
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| <a href="#">Public Comment No. 987-NFPA 70-2018 [New Section after 408.7]</a>      |                     |

**Related Item**

- PI 2935

## Submitter Information Verification

**Submitter Full Name:** James Dollard

**Organization:** IBEW Local Union 98

**Street Address:**

**City:**

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**Zip:**

**Submittal Date:** Tue Aug 21 09:41:27 EDT 2018

**Committee:** NEC-P13

## Committee Statement

**Committee** Rejected but see related SR

**Action:**

**Resolution:** [SR-7584-NFPA 70-2018](#)

**Statement:** This second revision is safety-driven and is necessary to prevent the reconditioning of products (automatic transfer switches) that cannot be reconditioned. This public comment is based on the global impact of public input 2935 which has ramifications that are global in nature and impacts all products referenced in the NEC under the purview of every CMP and does not represent new material. See the "NEMA Policy on Reconditioned Electrical Equipment." Some types of equipment are capable of being reconditioned, then re-evaluated to ensure compliance with the applicable product standards. Other types of equipment (automatic transfer switches) do not lend themselves to reconditioning due to the complexity of the product, the manufacturing process, or the level of knowledge the company performing the reconditioning may need, etc.

# **NEMA Policy on Reconditioned Electrical Equipment**

## **Executive Summary:**

The option of reconditioning existing equipment (instead of purchasing new equipment) exists today. Proper electrical equipment reconditioning provides a means to extend the life of electrical products as well as an opportunity in some cases to update installed equipment with the latest performance and safety features. However, not all components of the electrical infrastructure are candidates for reconditioning.

There are a number of precautions that must be adhered to when reconditioning electrical equipment if that equipment is to operate safely and with acceptable performance. Those precautions are discussed below and include the use of design qualified parts, testing to industry-recognized safety standards, original manufacturer specification and/or recommendations, when possible, and reconditioning performed by qualified personnel. The integrity of reconditioned electrical equipment must be established by documenting and demonstrating that component replacement has not compromised the manufacturer's original specifications and accepted industry standards.

The third party certification mark must be removed or obliterated from reconditioned electrical products to indicate that an evaluation of the reconditioning process or reconditioned product has not been conducted by the original third party.

As guidance, Appendix B provides a list of electrical products and components that are considered by NEMA suitable for reconditioning and Appendix A provides a list of electrical products considered not suitable for reconditioning. Medical Imaging Equipment is specifically not addressed by this policy (reference MITA 1, Good Refurbishment Practices for Medical Imaging Equipment).

## **Introduction:**

The U.S. electrical industry includes discussions on implementing new technologies to enhance existing electrical infrastructure. Further, sustainability and safeguarding the environment are growing in importance. In the midst of this is the option for reconditioning existing equipment. Paramount in all this is the fundamental priority that all electrical systems operate while safe-guarding personnel and infrastructure from potential hazards (electrical, mechanical, fire, etc.). This forms the basis for the NEMA position on reconditioning electrical products.

Given that electrical systems are diverse in design, function, and application, not all components of the electrical infrastructure are candidates for reconditioning.

## **Definition:**

Reconditioning: the process of restoring electromechanical systems, equipment, apparatus or components to operating conditions as recommended by the

manufacturer's instructions, using only design qualified parts. Reverse engineered parts (designs copied from existing parts by other manufacturers) are not considered to be "design qualified parts" unless specifically design verified under applicable Standards. Electrical industry practitioners and other organizations may also use the following terms/words to describe the process of reconditioning: remanufacturing, refurbishing, recycling, repairing, restoring, rebuilding, reengineering, and reusing.

In addition to design considerations, it is often impossible to obtain the service records, application environment, and operation parameters of all electrical components. Not having access to such information could have an adverse impact on the final safety and reliability of refurbished or reconditioned equipment. While NEMA supports the reconditioning of some electrical equipment, the components listed in Appendix A are not recommended for reconditioning, unless otherwise indicated by the original manufacturer. Normal servicing of equipment that remains within a facility should not be considered reconditioning or refurbishing. For electrical components suitable for reconditioning listed in Appendix B, the following fundamental tenets have been established.

### **Fundamental Tenets for Reconditioning Electrical Equipment**

- Reconditioning electrical equipment may be a viable option for extending operational lifetime of equipment and enhancing equipment with additional features.
- Electrical equipment reconditioning activity must be based on available guidance documentation from the Original Equipment Manufacturer, or industry-developed standards. Where any conflict in guidance is noted between the OEM and industry standards, the OEM guidance should take precedence.
- Electrical equipment must be reconditioned and qualified to an industry-developed standard that ensures equipment is in a usable and safe operating condition. An industry-developed standard is a widely agreed upon rule, set of rules, procedures or requirements for a product, assembly or process which are developed by members or organizations of an aggregate of manufacturing and technically productive enterprises in a particular field. Products deemed to be candidates for reconditioning must be reconditioned and qualified to industry standards containing the most relevant and critical design aspects, testing criteria and manufacturing specifications when the item was built.
- Reconditioning work must be performed by qualified personnel.
- Electrical equipment that has been exposed to adverse conditions, such as fire, water damage, etc., may not be suitable for reconditioning.
- A comprehensive assessment of the electrical equipment being considered for reconditioning with service records, application, environment, service life, and operating parameters is critical before deciding to pursue reconditioning of the electrical equipment and system. Trained, skilled technicians should be able to assess whether a device or system is suitable for reconditioning through physical inspection and test.
- Appendix A provides guidance on which components or assemblies of the electrical system are not suitable for reconditioning because they may pose a

hazard. Appendix B provides guidance on the components or assemblies are suitable for reconditioning.

- Reconditioning electrical equipment must utilize electrical product safety standards as they contain design aspects, testing criteria and manufacturing specifications to ensure a given product will function as intended. These requirements are established to deliver a usable and safe operating condition as a key component of intended product functionality.

## **Electrical Infrastructure and Worker Safety**

Electrical equipment that is properly installed, tested, maintained, and operated will provide reliable power as well as protect the electrical infrastructure. The reconditioning of electrical equipment requires the electrical industry, in collaboration with manufacturers, to establish performance specifications and accepted industry standards to help ensure safe and reliable equipment that help protect our electrical infrastructure so workers and users can continue to benefit from a safe and effective electrical system. Reconditioning standards must include prescriptive actions and performance requirements that result in equipment that complies with standards that include but are not limited to CSA, IEC, IEEE, NEC, OSHA, NFPA 70E, NFPA 70B, NETA ATS, NETA MTS, and EASA AR100 for example. Qualified personnel must possess the knowledge of how to assess equipment condition, potential hazards, and specifications to accurately determine the suitability for reconditioning. A safe and reliable electrical infrastructure that can be safely maintained is dependent on compliance with manufacturers' instructions, qualified workers, proper maintenance, and accepted industry standards for reconditioning activities.

## **Electrical Equipment Reliability, Performance and Safety**

Proper electrical equipment reconditioning provides a means to extend the life of electrical products as well as an opportunity to update installed equipment with the latest performance and safety features. Establishing well defined guidelines for those performing the reconditioning activity, based on original manufacturer's requirements, creates a solid foundation for the electrical industry and users. It is paramount that reconditioned electrical equipment be reliable in not only providing power, but also in safely performing its intended function as part of a safe operating electrical system. Understanding the environment, electrical load characteristics and historical maintenance performed on equipment being considered for reconditioning are all important parts of an assessment for reconditioning that can have a significant bearing on reliability, performance and safety. The electrical equipment manufacturer is the foremost authority on the design, performance and intended safe application of their product. Reconditioned electrical equipment must not compromise the reliability, performance, safe operation, or maintenance of the electrical system.

## **Integrity of Reconditioned Equipment**

Reconditioned electrical equipment must comply with all applicable standards at the time the equipment was initially built as a minimum as well as the original manufacturer's performance requirements in accordance with the nameplate markings and ratings. Replacement parts shall meet the design criteria (form, fit, and function) for the device to perform its intended function and provide safe operation. Replacement parts shall not include counterfeit parts (i.e., parts that have been misrepresented to be an authorized item of the legally authorized source.) Equipment shall operate safely in its intended application after reconditioning occurs. Care must be taken to ensure specific operations such as timing, sequencing, control, transfer, etc. continue to function in the manner originally intended, unless changes are specified during the reconditioning process. The integrity of reconditioned electrical equipment must be established by documenting and demonstrating that component replacement and performance changes have not compromised the manufacturer's specifications and accepted industry standards.

### **Listing or Certification Marks**

NEMA members manufacture products that are more than likely to be evaluated as part of a third party certification program to nationally recognized safety standards. These products can be marked with a listing or certification mark when the products are manufactured and shipped from the factory. The organization that reconditions the product is responsible for adhering to the guidelines from the issuing agency authorizing the mark to determine if the mark can remain on the product after reconditioning. The organization that reconditions is responsible for any actions necessary for the mark to remain on the product (analysis, testing, etc.). Otherwise, reconditioned electrical products must have their mark removed or obliterated to indicate that an evaluation of the reconditioning process has not been conducted by the original third party.

The organization that reconditions the product is additionally responsible for applying a mark or seal that indicates that the equipment has been reconditioned. This mark must provide traceability to the reconditioning organization in the event that it is necessary to determine the details of who reconditioned the equipment and the report on what was completed during this process.

There are a number of NEMA products that are not allowed to be reconditioned due to the inherent safety characteristics and requirements for those products to be evaluated according to a regular follow up program to evaluate the safety performance requirements as a condition of maintaining the listing or certification mark. This process cannot be applied to reconditioned electrical products since these are normally destructive tests and sample sets of reconditioned products are not possible due to limited quantities or ratings of specific devices.

### **UL Guidance on the UL Mark**

When the manufacturer places the UL Mark on the product at the factory, it is their attestation that the product complies with the applicable requirements. Unless there is further oversight or review/inspection (field inspection) UL cannot ascertain that the

product continues to comply with all requirements should field repairs, modifications or component replacements be made to the product.

Obviously there is little control over what manufacturers will or can do to equipment which left the factory with a certification mark. UL has created rebuilt categories where the reconditioning of product is done in an organized consistent manner under the supervision of UL's FUS (Follow-Up Services) field representatives. In these cases the first action conducted with equipment being rebuilt is the removal of the initial certification mark (if provided). Upon completion of the reconditioning, in accordance with the surveillance document, the manufacturer is permitted to affix a mark which clearly identifies the product as reconditioned.

Cases where a reconditioner is instructed to NOT remove any certification mark will result in confusion. Clearly such equipment in the field, which has undergone modification or reconditioning, is ineligible to bear a mark which designates a compliance with a certification standard.

# APPENDIX A

## COMPONENTS OR ASSEMBLIES NOT SUITABLE FOR RECONDITIONING\*

Adjustable speed drives  
Arc fault circuit breakers  
Ballasts  
Busway (mylar wrapped)  
Busway (powder coated)  
Cable tray  
Cast resin transformers  
Components containing semiconductors and transistors  
Control transformers  
Dry type transformers  
Electrical Connectors  
Electrical submetering equipment  
Electrical vehicle supply equipment  
Enclosed switches  
Fire detectors, smoke alarms, co detectors  
Fire pump controllers  
Flexible and extension cords  
Flexible conduit  
Ground fault circuit breakers  
High performance wire and cable  
Lighting controls  
Liquid filled transformers  
Low and medium voltage fuse holders  
Low and medium voltage non-renewable fuses  
Low voltage power circuit breaker electronic trip units  
Luminaires  
Meters (electromechanical, electronic or digital)  
Meter sockets  
Molded case circuit breakers  
Non-Metallic conduit, tubing, raceways and fittings  
Non-metallic surface raceways and fittings  
Outlet and junction boxes  
Overload relays  
Pin and sleeve plugs receptacles and connectors  
Power and control cable  
Protective relays (electronic or digital)  
Residential panel boards  
Solid state contactors and starters  
Solid state drives  
Strut type channel raceway  
Surface metal raceways and fittings  
Surge protective devices  
Transfer switches  
Wire or cable  
Wireway  
Wiring devices

\*The components or products listed above are not recommended for reconditioning, unless otherwise indicated by the original manufacturer.

## **APPENDIX B**

### **COMPONENTS OR ASSEMBLIES WHICH MAY BE RECONDITIONED**

Electromechanical protective relays, and current transformers

High voltage circuit breakers

Industrial and commercial panel boards

Low and medium voltage power circuit breakers

Low and medium voltage replaceable link fuses

Low voltage switchgear

Manual and magnetic controllers

Medium voltage switchgear

Metallic conduit, tubing, raceways and fittings

Motor control centers

Motors

Switchboards

Uninterruptible Power Supply Equipment

**Public Comment No. 1072-NFPA 70-2018 [ Section No. 700.8 ]****700.8** Surge Protection.

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

**Additional Proposed Changes**

| <u>File Name</u> | <u>Description</u>          | <u>Approved</u> |
|------------------|-----------------------------|-----------------|
| NEC_700.8.pdf    | NEC 700.8 - Proposed Change |                 |

**Statement of Problem and Substantiation for Public Comment**

The current code results in an excessive number of SPDs with no safety benefit. The SPD industry used to recommend two levels of protection, until 700.8 was adopted, then those recommendations disappeared from websites and literature. The current code results in 3, 4, or even more layers of protection. The current code results in SPDs in every panel and subpanel, including panels that are fed from feed-thru lugs upstream. The code simply does not make sense.

The proposed language matches what is in Article 708.20.D, which is much more sensible. What's good enough for a 911 center should be good enough for a standard emergency system.

**Related Item**

- Article 700.8

**Submitter Information Verification**

**Submitter Full Name:** Tim Janof  
**Organization:** [ Not Specified ]  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Wed Aug 22 14:49:49 EDT 2018  
**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected  
**Resolution:** The current requirement in 700.8 results in SPD protection in each switchboard and panelboard and a significant safety benefit. Adequate technical substantiation was not provided for the proposed revision.

Current Code language:

**700.8 Surge Protection.**

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

Proposed Revision:

**700.8 Surge Protection.**

A listed SPD shall be provided at all facility distribution voltage levels.

Justification:

The current code results in an excessive number of SPDs with no safety benefit. The SPD industry used to recommend two levels of protection, until 700.8 was adopted, then those recommendations disappeared from websites and literature. The current code results in 3, 4, or even more layers of protection. The current code results in SPDs in every panel and subpanel, including panels that are fed from feed-thru lugs upstream. The code simply does not make sense.

The proposed language matches what is in Article 708.20.D, which is much more sensible. What's good enough for a 911 center should be good enough for a standard emergency system.

**Public Comment No. 1412-NFPA 70-2018 [ Section No. 700.10 ]****700.10** Wiring, ~~Emergency System~~ Life Safety System .**(A)** Identification.

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

- (1) All boxes and enclosures (including transfer switches, generators, and power panels) ~~for emergency circuits~~ for Life Safety circuits shall be permanently marked as a component of ~~an emergency circuit or system of the Life Safety 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~~ the Life Safety system, at intervals not to exceed 7.6 m (25 ft).

Receptacles supplied from ~~the emergency system shall have a distinctive color or marking~~ the Life Safety system shall be RED color on the receptacle cover plates or the receptacles.

(B) Wiring.

Wiring from an emergency source or emergency source distribution overcurrent protection to emergency loads shall to Life Safety Systems, Legally Required Systems and Optional Standby Systems shall be kept entirely independent of each other and all other wiring and equipment unless otherwise permitted in 700.10(B)(1) through (B)(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 life safety luminaires, or in a common junction box, attached to exit or emergency luminaires or life safety 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 the life safety circuit supplied by the unit equipment
- (5) Wiring from an emergency source to supply emergency and other (nonemergency) loads supply life safety, legally required and optional stand by loads in accordance with 700.10(B)(5)a., (B)(5)b., (B)(5)c., and (B)(5)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 nonemergency system(s)

a.

- i. a life safety system and/or legally required system is selectively coordinated with the next downstream overcurrent protective device in

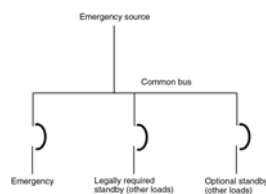
the nonemergency system(s)

a.

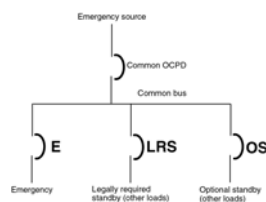
- i. the optional stand by system

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

**Figure Informational Note Figure 700.10(B)(a) Single or Multiple Feeders Without Overcurrent Protection.**



**Figure Informational Note Figure 700.10(B)(b) Single or Multiple Feeders with Overcurrent Protection.**



Emergency

- a. Life Safety, Legally Required and Optional Standby circuits shall not originate from the same vertical switchgear section, vertical switchboard section, panelboard enclosure, or individual disconnect enclosure as

other circuits.

- b. 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.

Wiring of two or more ~~emergency~~ circuits supplied from the same emergency source shall be permitted in the same raceway, cable, box, or cabinet.

**(C) Wiring Design and Location.**

~~Emergency wiring~~ Life Safety wiring circuits shall be designed and located so as to minimize the hazards that might cause failure due to flooding, fire, icing, vandalism, and other adverse conditions.

**(D) Fire Protection.**

**(1) Occupancies.**

~~Emergency systems~~ Life Safety systems shall meet the additional requirements in 700.10(D)(2) through (D)(4) in the following occupancies:

- (1) Assembly occupancies for not less than 1000 persons
- (2) Buildings above 23 m (75 ft) in height
- (3) Educational occupancies with more than 300 occupants

**(2) 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 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 with a minimum 2-hour fire rating.

Informational Note No. 1: Fire-resistive cables are tested to ANSI/UL 2196-2017, *Standard for Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data 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~~ only life safety circuits.
- (5) The cable or raceway is encased in a minimum of 50 mm (2 in.) of concrete.

**(3) Feeder-Circuit Equipment.**

Equipment for feeder circuits (including transfer switches, transformers, and panelboards) shall be located either in spaces fully protected by an approved automatic fire protection system or in spaces with a 2-hour fire resistance rating.

**(4) 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)(2). The integrity of the generator remote start circuit shall be monitored for broken, disconnected, or shorted wires. Loss of integrity shall start the generator(s). Loss of a phase of utility power or a complete loss of utility power shall start the generator and transfer Life Safety loads IAW 700.12

## Statement of Problem and Substantiation for Public Comment

In Article 700 we are introduced to Emergency Systems. Later in the article, 3 categories are named Emergency, Legally Required and Optional Standby. If "Emergency" is renamed "Life Safety" it would now describe a more urgent system to provide and maintain. Anyone who has a generator thinks it is Emergency power, but what does it really do? If it is to provide power in 10 seconds and energize egress lighting to get people out, it's Life Safety. If it's to provide heat and domestic water, it's optional standby.

### Related Item

- Emergency Systems

## Submitter Information Verification

**Submitter Full Name:** Michael Ose

**Organization:** OSBI  
**Street Address:**  
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**Submittal Date:** Tue Aug 28 09:46:25 EDT 2018  
**Committee:** NEC-P13

### Committee Statement

**Committee Action:** Rejected

**Resolution:** The proposed revision does not add clarity and would create tremendous confusion. The use of "emergency branch circuits" is well understood and easy to apply. Revising this text to "life safety branch circuits would not add clarity and would be confused with the life safety branch of the essential electrical system in article 517.



## Public Comment No. 1006-NFPA 70-2018 [ Section No. 700.12(D)(2)(a) ]

### (a) ~~On-Site~~ Fuel Supply.

Where internal combustion engines are used as the prime mover, ~~an on-site~~ the fuel supply shall be provided with an on-premises fuel supply sufficient for not less than 2 hours' operation of the system or a utility natural-gas fuel supply that meets the requirements for a continuous reliable fuel supply.

### Additional Proposed Changes

| <u>File Name</u>                                                                                      | <u>Description</u>                                                                                                                   | <u>Approved</u> |
|-------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Report_Handout_Natural_Gas_Weather_Resilience.pdf                                                     | Weather resilience report in the natural gas industry, 2017-2018 test results. This report was prepared for the natural gas council. |                 |
| GTI_Gas_Distribution_Reliability_Topical_Report_Final.pdf                                             | GTI Topical Report - Assessment of Natural Gas and Electric Distribution Service Reliability                                         |                 |
| Summary_Assessment-of-Natural-Gas-Electric-Distribution-Service-Reliability-SummaryReport-Jul2018.pdf | GTI Summary report - Assessment of Natural Gas and Electric Distribution Service Reliability                                         |                 |

### Statement of Problem and Substantiation for Public Comment

The change to the title will remove the limitation that the only option for a fuel supply is for it to be on-site. This change is also made in the text of the requirement.

The first reason for this change is that the requirement for an on-site fuel supply is limiting.

The second reason for this change is that a utility fed Natural gas fuel supply should be considered as a viable option for prime mover-driven Generators that are a part of Emergency Systems.

This change will treat an on-site and an utility fed natural gas fuel supply equally in the NEC.

Citizens' should have the option of using distributed natural gas where it can be shown that it is a continuous reliable fuel source. It will provide an alternative to the issues with fuel storage, fuel aging and fuel replenishment.

Historical experience and recent analyses done by industry professionals show a utility fed natural gas system can be a continuous reliable fuel supply.

Refer to the GTI analysis of natural gas reliability-GTI Topical Report: "Assessment of Natural Gas and Electric Distribution Service Reliability," July 19, 2018 and "Weather resilience report in the natural gas industry, 2017-2018 test results" attached to this submission.

Several recent severe weather storms that caused major outages of electric power did not have the same impact on the natural gas supply in the same areas.

Current NEC allowances for AHJ determinations on the use of natural gas as an alternative to on-site fuel supplies are not being consistently interpreted.

Anecdotal accounts have produced AHJ determinations that are "just following the NEC;"

(1) does not permit consideration of natural gas as an alternative to on-site supply,

(2) requires the AHJ to make a determination about the reliability of natural gas supply in the absence of specific allowance for its use granted by the NEC, and

(3) provides uncertainty about whether allowance of the use of natural gas is the status quo position of the NEC or needs to be expressly determined by the AHJ.

The current text of the NEC is producing inconsistent interpretations with respect to emergency power supplies and the use of pipeline natural gas.

The technology of utility fed natural gas engines is evolving and needs to be considered for emergency systems.

The proposed changes would go a long way to provide a clearer role of natural gas to local authorities and citizens.

Reference: The changes being proposed are similar to the requirements of CSA standard C282-15\_Emergency electrical power supply for buildings.

### Related Public Comments for This Document

| <u>Related Comment</u>                                          | <u>Relationship</u> |
|-----------------------------------------------------------------|---------------------|
| Public Comment No. 2011-NFPA 70-2018 [Section No. 701.12(D)(2)] |                     |
| Public Comment No. 2011-NFPA 70-2018 [Section No. 701.12(D)(2)] |                     |

#### Related Item

- PI 3159 and PI 3160

## Submitter Information Verification

**Submitter Full Name:** Jeff Jonas

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**City:**

**State:**

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**Submittal Date:** Tue Aug 21 12:08:37 EDT 2018

**Committee:** NEC-P13

## Committee Statement

**Committee Action:** Rejected

**Resolution:** The revised text as seen in the first draft provides significant clarity with respect to utility supplied natural gas fuel supplies. Each installation will be unique and it is imperative that the AHJ makes the determination of the probability of a simultaneous failure of both the off-site fuel delivery system and power from the outside electrical utility company.

**Public Comment No. 1012-NFPA 70-2018 [ Section No. 700.12(D)(2)(c) ]**

~~(c) Public Gas System, Municipal Water Supply.~~

~~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.~~

~~Exception:- 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 Comment**

This public comment is associated with PC 1006.

The goal of this public comment is to move the allowance of an off-site fuel supply (utility natural gas supply) from the exception of 700.12(D)(2)(c) to positive text of 700.12(D)(2)(a).

This makes more sense as 700.12(D)(2)(a) is referring to Fuel Supplies.

**Related Item**

- PI 3159 and PI 3160

**Submitter Information Verification**

**Submitter Full Name:** Jeff Jonas

**Organization:** Generac Power Systems, Inc.

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**City:**

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**Submission Date:** Tue Aug 21 12:25:04 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected

**Resolution:** The revised text as seen in the first draft provides significant clarity with respect to utility supplied natural gas fuel supplies. Each installation will be unique and it is imperative that the AHJ makes the determination of the probability of a simultaneous failure of both the off-site fuel delivery system and power from the outside electrical utility company.

**Public Comment No. 1020-NFPA 70-2018 [ Section No. 700.12(I)(2) ]****(2) Installation of Unit Equipment.**

Unit equipment shall be installed in accordance with 700.12(I)(2)(1) through (I)(2)(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 the following:
  - 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 one of the following:
  - a. The same branch circuit as that serving the normal lighting in the area and connected ahead of any local switches
  - b. A- Where the normal lighting is served by more than one branch circuit, a separate branch circuit, provided with a lock-on feature, that originates from the same panelboard as the normal lighting circuits
- (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 Comment**

The provision to permit the use of a separate branch circuit to supply the unit equipment where the normal lighting is supplied by a single circuit should not be permitted. A failure of that single normal lighting circuit will place the area in total darkness without activating the unit equipment.

**Related Item**

- Public Input No. 655-NFPA 70-2017

**Submitter Information Verification**

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**Organization:** [ Not Specified ]

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**Submittal Date:** Tue Aug 21 14:53:06 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** [SR-7605-NFPA 70-2018](#)

**Statement:** This revision provides necessary clarity and grammar.

**Public Comment No. 623-NFPA 70-2018 [ Section No. 700.12(I)(2) ]****(2) Installation of Unit Equipment.**

Unit equipment shall be installed in accordance with 700.12(I)(2)(1) through (I)(2)(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 the following:
  - 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 one of the following:
  - a. The same branch circuit as that serving the normal lighting in the area and connected ahead of any local switches
  - b. A separate branch circuit ~~provided with a lock-on feature~~, that originates from the same panelboard as the normal lighting circuits, provided that the branch circuit disconnecting means has 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 Comment**

The wording has been revised to provide clarity.

**Related Item**

- FR8095

**Submitter Information Verification**

**Submitter Full Name:** Daniel Neeser

**Organization:** Eaton's Bussmann Division

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Tue Aug 14 10:54:31 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7605-NFPA 70-2018

**Statement:** This revision provides necessary clarity and grammar.

**Public Comment No. 21-NFPA 70-2018 [ Section No. 700.16(B) ]****(B) System Reliability.**

Emergency lighting systems shall be designed and installed so that the failure of any illumination source cannot leave in total darkness any space that requires emergency illumination. Control devices in the emergency lighting system shall be listed for use in emergency systems. Listed unit equipment in accordance with 700.12(F) shall be considered as meeting the provisions of this section.

Informational note: 700.23 through 700.26 provide requirements for applications of emergency system control devices.

**Statement of Problem and Substantiation for Public Comment**

The wording in FR 7550 for clause 700.16(B) doesn't fully address comprehensive system reliability. The title of the paragraph is System Reliability, yet the subsequent wording limits the prohibited failure to only the light source itself. That follows the original thought of this section in the 2017 edition, but must now be modernized to accommodate sources other than tungsten lamps.

The panel statement says "The intent of system reliability is clarified by identifying an 'illumination source', not a 'lighting element' ". However, the wording in FR 7550 fails to acknowledge the potential complexity of a modern emergency lighting system and the many other elements whose failure would cause a failure of the emergency light source to illuminate. The addition of language reiterating the need for specific emergency system listing of control devices emphasizes that the reliability requirement also includes the control system. This was the core intent of original PI 1868.

This is further underscored by the informational note pointing the reader to sections in article 700 that are directly applicable to the control system.

In addition, PI 1868 was never targeted at increasing or changing the inherent reliability of Unit Equipment. Unit equipment is already covered by the requirements in 700.12(F) in the 2017 edition and that should be reiterated in 700.16(B).

PI 1868 was aimed at complex field assemblies of many different Listed emergency system control elements and emergency luminaires. The proposed revisions to the new wording in FR 7550 provide clarification of this.

This comment and substantiation are in alignment with the affirmative ballot comment submitted by CMP13 chair Linda J. Little.

**Related Item**

- PI 1868, FR7550

**Submitter Information Verification**

**Submitter Full Name:** Steven Terry  
**Organization:** Electronic Theatre Controls Inc  
**Affiliation:** US Institute for Theatre Technology  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Mon Jun 25 15:28:32 EDT 2018  
**Committee:** NEC-P13

**Committee Statement**

**Committee** Rejected but see related SR

**Action:**

**Resolution:** [SR-7607-NFPA 70-2018](#)

**Statement:** The text in FR 7550 for 700.16(B) does not fully address comprehensive system reliability. The title of this first level subdivision is "System Reliability", yet the subsequent wording limits the prohibited failure to only the light source itself. That follows the original thought of this section in the 2017 edition, but must now be modernized in accordance with the associated public input to accommodate sources other than tungsten lamps. The panel statement says "The intent of system reliability is clarified by identifying an 'illumination source', not a 'lighting

element' ". However, the wording in FR 7550 fails to acknowledge the potential complexity of a modern emergency lighting system and the many other elements whose failure would cause a failure of the emergency light source to illuminate. The control system must also be reliable. This was the core intent of original PI 1868. This is further underscored by the new informational note pointing the user to sections in article 700 that are directly applicable to the control system. In addition, PI 1868 was never targeted at increasing or changing the inherent reliability of Unit Equipment. Unit equipment is already covered by the requirements in 700.12(F) in the 2017 edition and that is very clearly reiterated in 700.16(B) by this second revision. PI 1868 was aimed at complex field assemblies of many different listed emergency system control elements and emergency luminaries. The proposed revisions to the new wording in FR 7550 provide clarification of this. This comment is not new material. This concept is in alignment with the affirmative ballot comment submitted by Linda J. Little.

**Public Comment No. 1152-NFPA 70-2018 [ 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 or loss thereof 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 Comment**

This additional clarifying language - "or loss thereof" - is needed to ensure that even the loss of an input signal needs to be covered. Without this, the loss of signal may be misinterpreted to fall out of this requirement (the false reasoning that it's not an external input during the signal loss). 0-10v luminaires are some of the most popular directly controlled luminaires in use and the loss of signal is quite often the trigger for full illumination when emergency power is present. However, some users misinterpret the loss of signal as meaning the external control input doesn't exist so the 700.24 doesn't apply. This is not the case nor the intention of 700.24. In fact, loss of signal for most other protocols does not imply a 'full on' or some other setting, and hence is often, but not always understood.

This additional language – "or loss thereof" - doesn't change the requirements, but is needed for more clarity.

**Related Item**

• FR 7564 • PI 1635

**Submitter Information Verification**

**Submitter Full Name:** Mitchell Hefter

**Organization:** Signify

**Street Address:**

**City:**

**State:**

**Zip:**

**Submission Date:** Thu Aug 23 17:31:58 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7608-NFPA 70-2018

**Statement:** The text added in this second revision "or loss thereof" does not technically change the requirement, it provides significant clarity. This additional clarifying text is needed to ensure that even the loss of an input signal needs to be covered. Without this, the loss of signal may be misinterpreted to fall out of this requirement (the false reasoning that it's not an external input during the signal loss). 0-10v luminaires are some of the most popular directly controlled luminaires in use and the loss of signal is quite often the trigger for full illumination when emergency power is present. However, some users misinterpret the loss of signal as meaning the external control input doesn't exist so the 700.24 doesn't apply.

**Public Comment No. 1501-NFPA 70-2018 [ 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: See informational note figure 700.32 for an example of how emergency system overcurrent protective devices (OCPD'Ss) selectively coordinate with all supply-side OCPD's.*

OCPD D selectively coordinates with OCPDs C, F, E, B and A.

OCPD C selectively coordinates with OCPDs F, E, B, and A.

OCPD F selectively coordinates with OCPD E.

OCPD B is not required to selectively coordinate with OCPD A because OCPD B is not an emergency system OCPD.

Informational Note Figure 700.32 Emergency System Selective Coordination

INSERT FIGURE HERE

**Additional Proposed Changes**

| <u>File Name</u>               | <u>Description</u>               | <u>Approved</u> |
|--------------------------------|----------------------------------|-----------------|
| Informational_Note_Figure.docx | Informational Note Figure 700.32 |                 |

**Statement of Problem and Substantiation for Public Comment**

This public comment seeks only to provide clarity.

The addition of an informational note with text and a figure provides significant clarity for the NEC user in the determination of how emergency system overcurrent protective devices (OCPD'Ss) selectively coordinate with all supply-side OCPD's.

**Related Item**

• PI 4135 • PI 4138

**Submitter Information Verification**

**Submitter Full Name:** James Dollard  
**Organization:** IBEW Local Union 98  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submission Date:** Wed Aug 29 08:40:36 EDT 2018  
**Committee:** NEC-P13

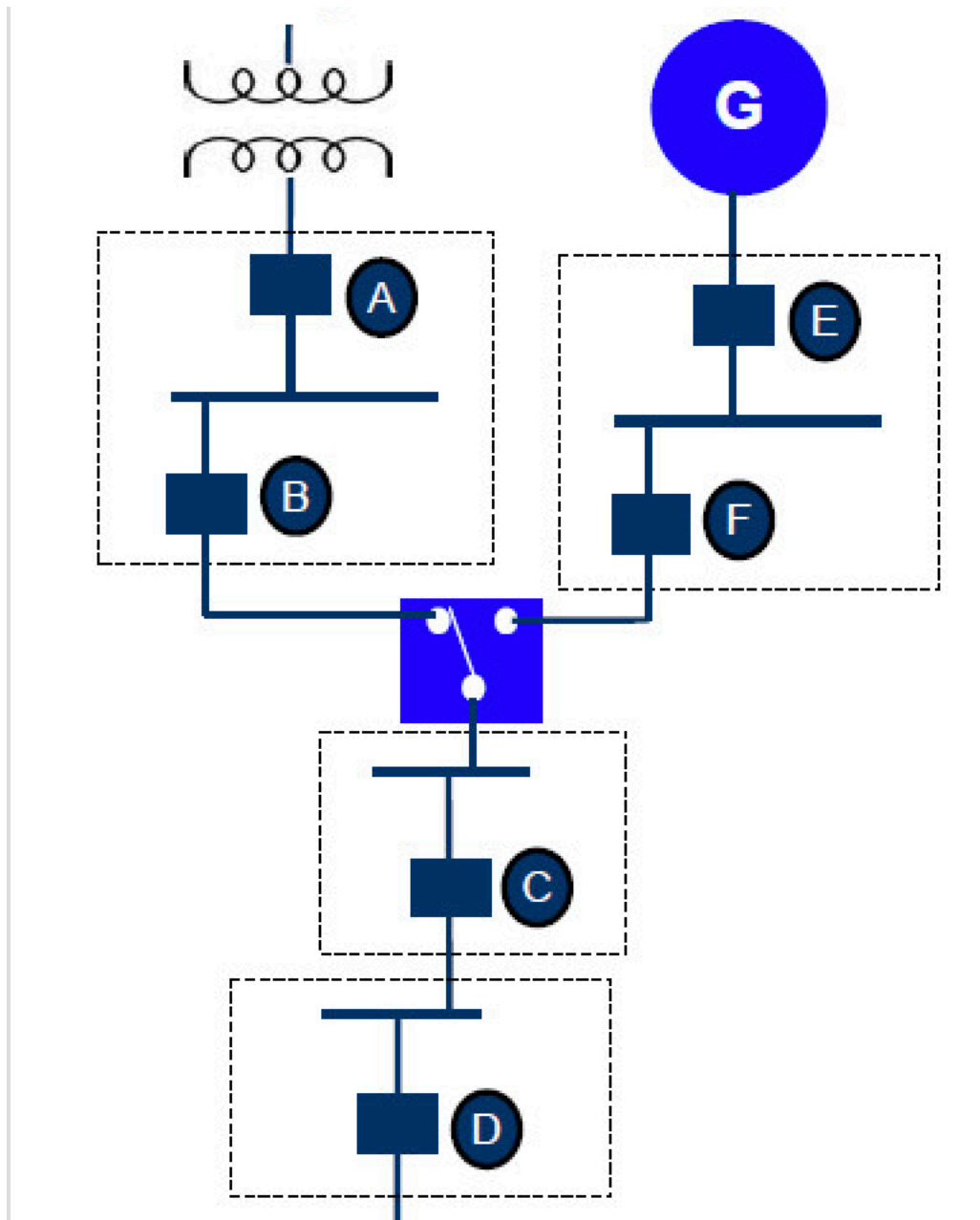
**Committee Statement**

**Committee Action:** Rejected but see related SR  
**Resolution:** SR-7616-NFPA 70-2018

**Statement:** This second revision inserts an informational note with an associated figure to provide clarity for the NEC user in the determination of how emergency system overcurrent protective devices (OCPDs) selectively coordinate with all supply-side OCPDs.

NORMAL  
SOURCE

EMERGENCY  
SOURCE



**Public Comment No. 1757-NFPA 70-2018 [ 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. Where overcurrent devices with adjustable trip settings are selectively coordinated, the coordination settings shall be marked on the equipment containing the overcurrent device(s). The adjustable trip settings shall be set by a qualified person

*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 Comment**

There is a safety issue that needs to be addressed. Selective coordination is now required by the NEC. The engineers are performing the study, designing high dollar breakers but the adjustable settings are not being adjusted from the factory and not being verified by the field. This change would help the problem. Please, ask around to your local inspector or electrician.

**Related Item**

- PI # 2736, 3452, 3705 & 684

**Submitter Information Verification**

**Submitter Full Name:** James Dorsey

**Organization:** Douglas County Electrical Insp

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Wed Aug 29 21:01:28 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected

**Resolution:** No new technical substantiation was provided. See the statement to resolve PI 684 in the first revision stage.

**Public Comment No. 625-NFPA 70-2018 [ Section No. 701.4(A) ]**

(A) Rating.

Legally required standby system equipment shall be suitable for the ~~maximum~~ available fault current at its terminals.

**Statement of Problem and Substantiation for Public Comment**

The word "maximum" needs to be deleted since "available fault current" is defined as maximum.

**Related Item**

- FR7576

**Submitter Information Verification**

**Submitter Full Name:** Daniel Neeser

**Organization:** Eaton's Bussmann Division

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Tue Aug 14 11:03:17 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Accepted

**Resolution:** SR-7629-NFPA 70-2018

**Statement:** In order to correlate with other actions in the first revision stage the word "maximum" is deleted since "available fault current" is defined as maximum.

**Public Comment No. 1318-NFPA 70-2018 [ Sections 701.4(B), 701.4(C) ]****Sections 701.4(B), 701.4(C)****(B) Capacity.**

A legally required standby system shall have adequate capacity ~~in accordance with Article 220~~ and rating for the supply of all equipment intended to be operated at one time .

**(C) Load Pickup, Load Shedding, and Peak Load Shaving.**

The alternate power source shall be permitted to supply legally required standby and optional standby system loads where the alternate source has adequate capacity or where automatic selective load pickup and load shedding are provided that will ensure adequate power to the legally required standby circuits.

**Statement of Problem and Substantiation for Public Comment**

The intent of the 2017 version of 701.4 should be put back. The statements below have been taken from literature provided by major generator manufacturers. Gensets should not be oversized and referring to Article 220 can lead to misapplication.

"Diesel engines can suffer damage as a result of misapplication or misuse - namely internal glazing and carbon buildup. This is a common problem in generator sets caused by failure to follow application and operating guidelines - ideally diesel engines should run at least around 60-75% of their maximum rated load."

"Operating a diesel generator set at load levels less than 30 percent of rated output for extended time periods impacts the unit negatively. "

It is important to understand that generator sets are designed to run and, to be specific, they are designed to run with load. This may seem trivial, but loading a generator set properly is essential to availability, healthy engine operation and long engine life.

**Related Item**

- FR-7576

**Submitter Information Verification**

**Submitter Full Name:** David Hittinger

**Organization:** IEC

**Affiliation:** Independent Electrical Contractors Inc.

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Sun Aug 26 22:43:20 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7669-NFPA 70-2018

**Statement:** This second revision recognizes that calculations are permitted to be made in accordance with Article 220 or by another approved method.



## Public Comment No. 985-NFPA 70-2018 [ Section No. 701.5(C) ]

### (C) Automatic Transfer Switches.

Automatic transfer switches shall be electrically operated and mechanically held. Automatic transfer switches shall not be permitted to be reconditioned.

## Additional Proposed Changes

### File Name

### Description Approved

NEMA-Position\_Refubishing\_on\_ElecEquip.pdf

## Statement of Problem and Substantiation for Public Comment

This public comment is submitted by an NEC Correlating Committee appointed task group to address the global impacts of PI 2935. This PI would have required that "Reconditioned Equipment" be "listed as "reconditioned" and the "original listing marks removed". This PI has ramifications that are global in nature and impacts all products referenced in the NEC under the purview of every CMP.

This proposed new section is safety-driven and is necessary to prevent the reconditioning of products that cannot be reconditioned.

This public comment is based on the global impact of public input 2935 and does not represent new material.

The "NEMA Policy on Reconditioned Electrical Equipment" is attached to this public comment. See also global public comment 979.

The substantiation for global public comment 979 is provided below:

Public Comment No. 979-NFPA 70-2018 [Global Input]

This Public Comment is submitted on behalf of a task group appointed by the NEC® Correlating Committee. This Task Group was appointed to review the use of refurbished equipment throughout the NEC®. Task Group members are Jim Dollard, Robert Osborne, Jim Pierce, and David Williams. This task group has been charged with reviewing Public Input (PI) 2935 which was resolved by CMP-1 during the first draft stage. This PI would have required that "Reconditioned Equipment" be "listed as "reconditioned" and the "original listing marks removed". This PI has ramifications that are global in nature and impacts all products referenced in the NEC under the purview of every CMP.

Task group members noted that some types of equipment are capable of being reconditioned, then re-evaluated to ensure compliance with the applicable product standards. Other types of equipment do not lend themselves to reconditioning due to the complexity of the product, the manufacturing process, or the level of knowledge the company performing the reconditioning may need, etc.

The "NEMA Policy on Reconditioned Electrical Equipment" details the following aspects of Reconditioning of Electrical Equipment:

- Fundamental Tenets for Reconditioning Electrical Equipment
- Electrical Infrastructure and Worker Safety
- Integrity of Reconditioned Equipment
- Listing or Certification Marks
- UL Guidance on the UL Mark
- Components or Assemblies Not Suitable For Reconditioning (Appendix A)
- Components or Assemblies Which May Be Reconditioned (Appendix B)

A PDF copy of this NEMA policy is attached and may also be found on the internet at the following URL:  
[https://www.nema.org/Policy/Documents/NEMA-Position\\_Refubishing%20on%20ElecEquip.pdf](https://www.nema.org/Policy/Documents/NEMA-Position_Refubishing%20on%20ElecEquip.pdf)

NEC® Section 110.21(A)(2), which was new for the 2017 Edition of the NEC®, included marking requirements for "Reconditioned Equipment". PI 2935 would have required that "Reconditioned Equipment" be "listed as "reconditioned" and the "original listing marks removed". CMP 1 resolved this PI. This Task Group appointed by the NEC® Correlating Committee has developed a number of public comments, based on the products identified in the referenced NEMA document, to determine whether or not equipment can be reconditioned, and if reconditioned, what additional requirements apply.

While several public comments were developed for specific equipment by this task group, not all equipment was addressed (neither was all the equipment noted in the NEMA Policy document addressed). This Global Public Comment requests each CMP to review the products required to be listed under their purview and determine whether reconditioning should be

permitted. It is recommended that the NEMA Policy document be used as one of the guidelines in making this determination. It is also recommended that one of the following options/examples be chosen for listed equipment:

**Option 1 - Equipment NOT suitable for Reconditioning (EXAMPLE):**

695.10 Listed Equipment. Diesel engine fire pump controllers, electric fire pump controllers, electric motors, fire pump power transfer switches, foam pump controllers, and limited service controllers shall be listed for fire pump service. [20:9.5.1.1, 10.1.2.1, 12.1.3.1]

Fire pump controllers and transfer switches shall not be permitted to be reconditioned.

**Option 2 - Equipment which MAY BE suitable for Reconditioning (EXAMPLE):**

408.8 Reconditioned Equipment.

(A) Panelboards. The use of reconditioned panelboards shall comply with (1) and (2):

(1) Industrial and commercial panelboards shall be permitted to be reconditioned. Reconditioned equipment shall be listed as "reconditioned" and the original listing mark removed.

(2) Panelboards installed in dwelling units shall not be permitted to be reconditioned.

(B) Switchboards and Switchgear. Low voltage switchgear, medium voltage switchgear and switchboards shall be permitted to be reconditioned. Reconditioned equipment shall be listed as "reconditioned" and the original listing mark removed.

Note that equipment where no specific guidance is provided would be permitted to be reconditioned and would only be required to meet the marking requirements in 110.21(A)(2).

## Related Public Comments for This Document

| <u>Related Comment</u>                                                             | <u>Relationship</u> |
|------------------------------------------------------------------------------------|---------------------|
| <a href="#">Public Comment No. 979-NFPA 70-2018 [Global Input]</a>                 |                     |
| <a href="#">Public Comment No. 980-NFPA 70-2018 [New Section after 240.87(B)]</a>  |                     |
| <a href="#">Public Comment No. 981-NFPA 70-2018 [New Section after 240.61]</a>     |                     |
| <a href="#">Public Comment No. 982-NFPA 70-2018 [New Section after 240.101(B)]</a> |                     |
| <a href="#">Public Comment No. 983-NFPA 70-2018 [Section No. 695.10]</a>           |                     |
| <a href="#">Public Comment No. 984-NFPA 70-2018 [Section No. 700.5(C)]</a>         |                     |
| <a href="#">Public Comment No. 986-NFPA 70-2018 [Section No. 702.5]</a>            |                     |
| <a href="#">Public Comment No. 987-NFPA 70-2018 [New Section after 408.7]</a>      |                     |
| <a href="#">Public Comment No. 979-NFPA 70-2018 [Global Input]</a>                 |                     |
| <a href="#">Public Comment No. 980-NFPA 70-2018 [New Section after 240.87(B)]</a>  |                     |
| <a href="#">Public Comment No. 981-NFPA 70-2018 [New Section after 240.61]</a>     |                     |
| <a href="#">Public Comment No. 982-NFPA 70-2018 [New Section after 240.101(B)]</a> |                     |
| <a href="#">Public Comment No. 983-NFPA 70-2018 [Section No. 695.10]</a>           |                     |
| <a href="#">Public Comment No. 984-NFPA 70-2018 [Section No. 700.5(C)]</a>         |                     |
| <a href="#">Public Comment No. 986-NFPA 70-2018 [Section No. 702.5]</a>            |                     |
| <a href="#">Public Comment No. 987-NFPA 70-2018 [New Section after 408.7]</a>      |                     |

**Related Item**

- PI 2935

## Submitter Information Verification

**Submitter Full Name:** James Dollard

**Organization:** IBEW Local Union 98

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Tue Aug 21 09:50:21 EDT 2018

**Committee:** NEC-P13

## Committee Statement

**Committee** Rejected but see related SR

**Action:**

**Resolution:** [SR-7586-NFPA 70-2018](#)

**Statement:** This second revision is safety-driven and is necessary to prevent the reconditioning of products (automatic transfer switches) that cannot be reconditioned. This public comment is based on the global impact of public input 2935 which has ramifications that are global in nature and impacts all products referenced in the NEC under the purview of every CMP and does not represent new material. See the "NEMA Policy on Reconditioned Electrical Equipment." Some types of equipment are capable of being reconditioned, then re-evaluated to ensure compliance with the applicable product standards. Other types of equipment (automatic transfer switches) do not lend themselves to reconditioning due to the complexity of the product, the manufacturing process, or the level of knowledge the company performing the reconditioning may need, etc.

# **NEMA Policy on Reconditioned Electrical Equipment**

## **Executive Summary:**

The option of reconditioning existing equipment (instead of purchasing new equipment) exists today. Proper electrical equipment reconditioning provides a means to extend the life of electrical products as well as an opportunity in some cases to update installed equipment with the latest performance and safety features. However, not all components of the electrical infrastructure are candidates for reconditioning.

There are a number of precautions that must be adhered to when reconditioning electrical equipment if that equipment is to operate safely and with acceptable performance. Those precautions are discussed below and include the use of design qualified parts, testing to industry-recognized safety standards, original manufacturer specification and/or recommendations, when possible, and reconditioning performed by qualified personnel. The integrity of reconditioned electrical equipment must be established by documenting and demonstrating that component replacement has not compromised the manufacturer's original specifications and accepted industry standards.

The third party certification mark must be removed or obliterated from reconditioned electrical products to indicate that an evaluation of the reconditioning process or reconditioned product has not been conducted by the original third party.

As guidance, Appendix B provides a list of electrical products and components that are considered by NEMA suitable for reconditioning and Appendix A provides a list of electrical products considered not suitable for reconditioning. Medical Imaging Equipment is specifically not addressed by this policy (reference MITA 1, Good Refurbishment Practices for Medical Imaging Equipment).

## **Introduction:**

The U.S. electrical industry includes discussions on implementing new technologies to enhance existing electrical infrastructure. Further, sustainability and safeguarding the environment are growing in importance. In the midst of this is the option for reconditioning existing equipment. Paramount in all this is the fundamental priority that all electrical systems operate while safe-guarding personnel and infrastructure from potential hazards (electrical, mechanical, fire, etc.). This forms the basis for the NEMA position on reconditioning electrical products.

Given that electrical systems are diverse in design, function, and application, not all components of the electrical infrastructure are candidates for reconditioning.

## **Definition:**

Reconditioning: the process of restoring electromechanical systems, equipment, apparatus or components to operating conditions as recommended by the

manufacturer's instructions, using only design qualified parts. Reverse engineered parts (designs copied from existing parts by other manufacturers) are not considered to be "design qualified parts" unless specifically design verified under applicable Standards. Electrical industry practitioners and other organizations may also use the following terms/words to describe the process of reconditioning: remanufacturing, refurbishing, recycling, repairing, restoring, rebuilding, reengineering, and reusing.

In addition to design considerations, it is often impossible to obtain the service records, application environment, and operation parameters of all electrical components. Not having access to such information could have an adverse impact on the final safety and reliability of refurbished or reconditioned equipment. While NEMA supports the reconditioning of some electrical equipment, the components listed in Appendix A are not recommended for reconditioning, unless otherwise indicated by the original manufacturer. Normal servicing of equipment that remains within a facility should not be considered reconditioning or refurbishing. For electrical components suitable for reconditioning listed in Appendix B, the following fundamental tenets have been established.

### **Fundamental Tenets for Reconditioning Electrical Equipment**

- Reconditioning electrical equipment may be a viable option for extending operational lifetime of equipment and enhancing equipment with additional features.
- Electrical equipment reconditioning activity must be based on available guidance documentation from the Original Equipment Manufacturer, or industry-developed standards. Where any conflict in guidance is noted between the OEM and industry standards, the OEM guidance should take precedence.
- Electrical equipment must be reconditioned and qualified to an industry-developed standard that ensures equipment is in a usable and safe operating condition. An industry-developed standard is a widely agreed upon rule, set of rules, procedures or requirements for a product, assembly or process which are developed by members or organizations of an aggregate of manufacturing and technically productive enterprises in a particular field. Products deemed to be candidates for reconditioning must be reconditioned and qualified to industry standards containing the most relevant and critical design aspects, testing criteria and manufacturing specifications when the item was built.
- Reconditioning work must be performed by qualified personnel.
- Electrical equipment that has been exposed to adverse conditions, such as fire, water damage, etc., may not be suitable for reconditioning.
- A comprehensive assessment of the electrical equipment being considered for reconditioning with service records, application, environment, service life, and operating parameters is critical before deciding to pursue reconditioning of the electrical equipment and system. Trained, skilled technicians should be able to assess whether a device or system is suitable for reconditioning through physical inspection and test.
- Appendix A provides guidance on which components or assemblies of the electrical system are not suitable for reconditioning because they may pose a

hazard. Appendix B provides guidance on the components or assemblies are suitable for reconditioning.

- Reconditioning electrical equipment must utilize electrical product safety standards as they contain design aspects, testing criteria and manufacturing specifications to ensure a given product will function as intended. These requirements are established to deliver a usable and safe operating condition as a key component of intended product functionality.

## **Electrical Infrastructure and Worker Safety**

Electrical equipment that is properly installed, tested, maintained, and operated will provide reliable power as well as protect the electrical infrastructure. The reconditioning of electrical equipment requires the electrical industry, in collaboration with manufacturers, to establish performance specifications and accepted industry standards to help ensure safe and reliable equipment that help protect our electrical infrastructure so workers and users can continue to benefit from a safe and effective electrical system. Reconditioning standards must include prescriptive actions and performance requirements that result in equipment that complies with standards that include but are not limited to CSA, IEC, IEEE, NEC, OSHA, NFPA 70E, NFPA 70B, NETA ATS, NETA MTS, and EASA AR100 for example. Qualified personnel must possess the knowledge of how to assess equipment condition, potential hazards, and specifications to accurately determine the suitability for reconditioning. A safe and reliable electrical infrastructure that can be safely maintained is dependent on compliance with manufacturers' instructions, qualified workers, proper maintenance, and accepted industry standards for reconditioning activities.

## **Electrical Equipment Reliability, Performance and Safety**

Proper electrical equipment reconditioning provides a means to extend the life of electrical products as well as an opportunity to update installed equipment with the latest performance and safety features. Establishing well defined guidelines for those performing the reconditioning activity, based on original manufacturer's requirements, creates a solid foundation for the electrical industry and users. It is paramount that reconditioned electrical equipment be reliable in not only providing power, but also in safely performing its intended function as part of a safe operating electrical system. Understanding the environment, electrical load characteristics and historical maintenance performed on equipment being considered for reconditioning are all important parts of an assessment for reconditioning that can have a significant bearing on reliability, performance and safety. The electrical equipment manufacturer is the foremost authority on the design, performance and intended safe application of their product. Reconditioned electrical equipment must not compromise the reliability, performance, safe operation, or maintenance of the electrical system.

## **Integrity of Reconditioned Equipment**

Reconditioned electrical equipment must comply with all applicable standards at the time the equipment was initially built as a minimum as well as the original manufacturer's performance requirements in accordance with the nameplate markings and ratings. Replacement parts shall meet the design criteria (form, fit, and function) for the device to perform its intended function and provide safe operation. Replacement parts shall not include counterfeit parts (i.e., parts that have been misrepresented to be an authorized item of the legally authorized source.) Equipment shall operate safely in its intended application after reconditioning occurs. Care must be taken to ensure specific operations such as timing, sequencing, control, transfer, etc. continue to function in the manner originally intended, unless changes are specified during the reconditioning process. The integrity of reconditioned electrical equipment must be established by documenting and demonstrating that component replacement and performance changes have not compromised the manufacturer's specifications and accepted industry standards.

### **Listing or Certification Marks**

NEMA members manufacture products that are more than likely to be evaluated as part of a third party certification program to nationally recognized safety standards. These products can be marked with a listing or certification mark when the products are manufactured and shipped from the factory. The organization that reconditions the product is responsible for adhering to the guidelines from the issuing agency authorizing the mark to determine if the mark can remain on the product after reconditioning. The organization that reconditions is responsible for any actions necessary for the mark to remain on the product (analysis, testing, etc.). Otherwise, reconditioned electrical products must have their mark removed or obliterated to indicate that an evaluation of the reconditioning process has not been conducted by the original third party.

The organization that reconditions the product is additionally responsible for applying a mark or seal that indicates that the equipment has been reconditioned. This mark must provide traceability to the reconditioning organization in the event that it is necessary to determine the details of who reconditioned the equipment and the report on what was completed during this process.

There are a number of NEMA products that are not allowed to be reconditioned due to the inherent safety characteristics and requirements for those products to be evaluated according to a regular follow up program to evaluate the safety performance requirements as a condition of maintaining the listing or certification mark. This process cannot be applied to reconditioned electrical products since these are normally destructive tests and sample sets of reconditioned products are not possible due to limited quantities or ratings of specific devices.

### **UL Guidance on the UL Mark**

When the manufacturer places the UL Mark on the product at the factory, it is their attestation that the product complies with the applicable requirements. Unless there is further oversight or review/inspection (field inspection) UL cannot ascertain that the

product continues to comply with all requirements should field repairs, modifications or component replacements be made to the product.

Obviously there is little control over what manufacturers will or can do to equipment which left the factory with a certification mark. UL has created rebuilt categories where the reconditioning of product is done in an organized consistent manner under the supervision of UL's FUS (Follow-Up Services) field representatives. In these cases the first action conducted with equipment being rebuilt is the removal of the initial certification mark (if provided). Upon completion of the reconditioning, in accordance with the surveillance document, the manufacturer is permitted to affix a mark which clearly identifies the product as reconditioned.

Cases where a reconditioner is instructed to NOT remove any certification mark will result in confusion. Clearly such equipment in the field, which has undergone modification or reconditioning, is ineligible to bear a mark which designates a compliance with a certification standard.

# APPENDIX A

## COMPONENTS OR ASSEMBLIES NOT SUITABLE FOR RECONDITIONING\*

Adjustable speed drives  
Arc fault circuit breakers  
Ballasts  
Busway (mylar wrapped)  
Busway (powder coated)  
Cable tray  
Cast resin transformers  
Components containing semiconductors and transistors  
Control transformers  
Dry type transformers  
Electrical Connectors  
Electrical submetering equipment  
Electrical vehicle supply equipment  
Enclosed switches  
Fire detectors, smoke alarms, co detectors  
Fire pump controllers  
Flexible and extension cords  
Flexible conduit  
Ground fault circuit breakers  
High performance wire and cable  
Lighting controls  
Liquid filled transformers  
Low and medium voltage fuse holders  
Low and medium voltage non-renewable fuses  
Low voltage power circuit breaker electronic trip units  
Luminaires  
Meters (electromechanical, electronic or digital)  
Meter sockets  
Molded case circuit breakers  
Non-Metallic conduit, tubing, raceways and fittings  
Non-metallic surface raceways and fittings  
Outlet and junction boxes  
Overload relays  
Pin and sleeve plugs receptacles and connectors  
Power and control cable  
Protective relays (electronic or digital)  
Residential panel boards  
Solid state contactors and starters  
Solid state drives  
Strut type channel raceway  
Surface metal raceways and fittings  
Surge protective devices  
Transfer switches  
Wire or cable  
Wireway  
Wiring devices

\*The components or products listed above are not recommended for reconditioning, unless otherwise indicated by the original manufacturer.

## **APPENDIX B**

### **COMPONENTS OR ASSEMBLIES WHICH MAY BE RECONDITIONED**

Electromechanical protective relays, and current transformers

High voltage circuit breakers

Industrial and commercial panel boards

Low and medium voltage power circuit breakers

Low and medium voltage replaceable link fuses

Low voltage switchgear

Manual and magnetic controllers

Medium voltage switchgear

Metallic conduit, tubing, raceways and fittings

Motor control centers

Motors

Switchboards

Uninterruptible Power Supply Equipment

**Public Comment No. 1943-NFPA 70-2018 [ Section No. 701.12(D)(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. Where and 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.

**Statement of Problem and Substantiation for Public Comment**

Precise wording to be considered for this section should be taken from a Public Comment of Mr. Jeff Jonas, proponent of Public Input No. 4151, who is expected to submit his own Public Comment on this text. The material need to change this section comes from recent natural catastrophic events in which power supplies were disrupted for days, not hours. In the case of these events, a two-hour onsite fuel supply would provide insignificant relief from public safety and welfare issues resulting from a grid power outage. In those cases, clear allowance for supply of pipeline natural gas would mitigate the consequences of power disruptions consistent with recent experience where pipeline natural gas supplying emergency power generators met on site power needs. AGA believes that it is in the public interest to allow use of continuously-supplied and reliable pipeline natural gas as a means of meeting emergency power needs. AGA will defer to the proposal of Mr. Jonas or, if the Technical Committee deems that his proposal is insufficient, to a Technical Committee-generated proposal to add this issue of public safety and welfare.

**Related Item**

- PI 4151

**Submitter Information Verification**

**Submitter Full Name:** Ted Williams

**Organization:** American Gas Association

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Thu Aug 30 12:51:37 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected

**Resolution:** The revised text as seen in the first draft provides significant clarity with respect to utility supplied natural gas fuel supplies. Each installation will be unique and it is imperative that the AHJ makes the determination of the probability of a simultaneous failure of both the off-site fuel delivery system and power from the outside electrical utility company.

**Public Comment No. 2011-NFPA 70-2018 [ Section No. 701.12(D)(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 or a utility natural-gas fuel supply that meets the requirements for a continuous reliable fuel supply . 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**

| <u>File Name</u>                                                                                      | <u>Description</u>                         | <u>Approved</u> |
|-------------------------------------------------------------------------------------------------------|--------------------------------------------|-----------------|
| GTI_Gas_Distribution_Reliability_Topical_Report_Final.pdf                                             | Natural gas reliability report.            |                 |
| Summary_Assessment-of-Natural-Gas-Electric-Distribution-Service-Reliability-SummaryReport-Jul2018.pdf | Summary of Natural gas reliability report. |                 |
| Report_Handout_Natural_Gas_Weather_Resilience.pdf                                                     | Natural gas reliability report             |                 |

**Statement of Problem and Substantiation for Public Comment**

The first reason for this change is that the requirement for an on-site fuel supply is limiting.

The second reason for this change is that a utility fed Natural gas fuel supply should be considered as a viable option for prime mover-driven Generators that are a part of Emergency Systems. This change will treat an on-site and an utility fed natural gas fuel supply equally in the NEC.

Citizens' should have the option of using distributed natural gas where it can be shown that it is a continuous reliable fuel source.

It will provide an alternative to the issues with fuel storage, fuel aging and fuel replenishment. Historical experience and recent analyses done by industry professionals show a utility fed natural gas system can be a continuous reliable fuel supply.

Refer to the GTI analysis of natural gas reliability-GTI Topical Report: "Assessment of Natural Gas and Electric Distribution Service Reliability," July 19, 2018 and "Weather resilience report in the natural gas industry, 2017-2018 test results" attached to this submission.

Several recent severe weather storms that caused major outages of electric power did not have the same result on the natural gas supply in the same areas.

Current NEC allowances for AHJ determinations on the use of natural gas as an alternative to on-site fuel supplies are not being consistently interpreted.

Anecdotal accounts have produced AHJ determinations that are "just following the NEC;"

(1) does not permit consideration of natural gas as an alternative to on-site supply,

(2) requires the AHJ to make a determination about the reliability of natural gas supply in the absence of specific allowance for its use granted by the NEC, and

(3) provides uncertainty about whether allowance of the use of natural gas is the status quo position of the NEC or needs to be expressly determined by the AHJ.

The current text of the NEC is producing inconsistent interpretations with respect to emergency power supplies and the use of pipeline natural gas. The technology of utility fed natural gas engines is evolving and needs to be considered for emergency systems. The proposed changes would go far to provide a clearer role of natural gas to local authorities and citizens.

Reference: The changes being proposed are similar to the requirements of CSA standard C282-15\_Emergency electrical power supply for buildings.

**Related Public Comments for This Document**

| <u>Related Comment</u>                                                             | <u>Relationship</u> |
|------------------------------------------------------------------------------------|---------------------|
| <a href="#">Public Comment No. 1006-NFPA 70-2018 [Section No. 700.12(D)(2)(a)]</a> |                     |
| <a href="#">Public Comment No. 1006-NFPA 70-2018 [Section No. 700.12(D)(2)(a)]</a> |                     |
| <a href="#">Public Comment No. 2012-NFPA 70-2018 [Section No. 701.12(D)(3)]</a>    |                     |

**Related Item**

- PI 4151

**Submitter Information Verification**

**Submitter Full Name:** Jeff Jonas

**Organization:** Generac Power Systems, Inc.

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Thu Aug 30 14:40:50 EDT 2018

**Committee:** NEC-P13

### Committee Statement

**Committee Action:** Rejected

**Resolution:** The revised text as seen in the first draft provides significant clarity with respect to utility supplied natural gas fuel supplies. Each installation will be unique and it is imperative that the AHJ makes the determination of the probability of a simultaneous failure of both the off-site fuel delivery system and power from the outside electrical utility company.

**Public Comment No. 1973-NFPA 70-2018 [ Section No. 701.12(D)(3) ]****(3) ~~Public Gas System,~~ Municipal Water Supply.**

Prime movers shall not be solely dependent on ~~a public utility gas system for their fuel supply or on a~~ upon 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 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 Comment**

AGA can find no data or well-reasoned justification for singling out "public" gas systems as needed to meet the requirements of the current text. No data could be found that suggests that public gas systems are somehow less reliable than other gas systems (specifically, investor-owned gas systems). It should be pointed out that "public" gas systems are widely known as municipally-owned systems. If the intent of the current text is to apply to a broader range of systems (i.e., to include investor-owned systems), the text is unclear on this point, and applying and justifying the requirements has a much more ambiguous outcome.

In AGA's research into interpretation of emergency power systems and NEC coverage of pipeline natural gas supply as a fuel source, anecdotes of jurisdictions "across the river" permitting pipeline natural gas supply for emergency generators differently. This is not in the interest of NFPA, and efforts to harmonize requirements ought to be paramount. To that end, the exception language of the section is proposed for deletion since, as one utility point out, AHJ interpretation of "just following the NEC" has depended upon whether the exception permits the activity or requires AHJ permission. We could agree to our interpretation of the current language, but in the field, that interpretation is not being made on a consistent basis.

**Related Item**

- PI 379

**Submitter Information Verification**

**Submitter Full Name:** Ted Williams

**Organization:** American Gas Association

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Thu Aug 30 13:17:30 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected

**Resolution:** The revised text as seen in the first draft provides significant clarity with respect to utility supplied natural gas fuel supplies. Each installation will be unique and it is imperative that the AHJ makes the determination of the probability of a simultaneous failure of both the off-site fuel delivery system and power from the outside electrical utility company.

**Public Comment No. 2012-NFPA 70-2018 [ Section No. 701.12(D)(3) ]****(3) ~~Public Gas System,~~ Municipal Water Supply.**

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 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 Comment**

The goal of this public comment is to move the allowance of an off-site fuel supply (utility natural gas supply) from the exception of 701.12(D)(3) to positive text of 701.12(D)(2). This makes more sense as 701.12(D)(2) is referring to Internal Combustion Engines and their fuel supplies.

**Related Public Comments for This Document**

| <u>Related Comment</u>                                          | <u>Relationship</u>       |
|-----------------------------------------------------------------|---------------------------|
| Public Comment No. 2011-NFPA 70-2018 [Section No. 701.12(D)(2)] | Changes are interrelated. |
| <u>Related Item</u>                                             |                           |
| • PI 4155                                                       |                           |

**Submitter Information Verification**

**Submitter Full Name:** Jeff Jonas  
**Organization:** Generac Power Systems, Inc.  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Thu Aug 30 14:41:31 EDT 2018  
**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected  
**Resolution:** The revised text as seen in the first draft provides significant clarity with respect to utility supplied natural gas fuel supplies. Each installation will be unique and it is imperative that the AHJ makes the determination of the probability of a simultaneous failure of both the off-site fuel delivery system and power from the outside electrical utility company.

**Public Comment No. 1506-NFPA 70-2018 [ Section No. 701.32 ]****701.32 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.*

*Informational Note: See informational note figure 701.32 for an example of how legally required standby system overcurrent protective devices (OCPD'Ss) selectively coordinate with all supply-side OCPD's.*

OCPD D selectively coordinates with OCPDs C, F, E, B and A.

OCPD C selectively coordinates with OCPDs F, E, B, and A.

OCPD F selectively coordinates with OCPD E.

OCPD B is not required to selectively coordinate with OCPD A because OCPD B is not a legally required standby system OCPD.

Informational Note Figure 700.31 Legally Required Standby System Selective Coordination

INSERT FIGURE HERE

**Additional Proposed Changes**

| <u>File Name</u>                   | <u>Description</u>               | <u>Approved</u> |
|------------------------------------|----------------------------------|-----------------|
| Informational_Note_Figure-701.docx | Informational Note Figure 701.32 |                 |

**Statement of Problem and Substantiation for Public Comment**

This public comment seeks only to provide clarity.

The addition of an informational note with text and a figure provides significant clarity for the NEC user in the determination of how legally required standby system overcurrent protective devices (OCPD'Ss) selectively coordinate with all supply-side OCPD's.

**Related Item**

• PI 4135 • PI 4138

**Submitter Information Verification**

**Submitter Full Name:** James Dollard  
**Organization:** IBEW Local Union 98  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submission Date:** Wed Aug 29 09:24:37 EDT 2018  
**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR  
**Resolution:** SR-7619-NFPA 70-2018

**Statement:** This second revision inserts an informational note with an associated figure to provide clarity for the NEC user in the determination of how emergency system overcurrent protective devices (OCPDs) selectively coordinate with all supply-side OCPDs.

**Public Comment No. 1768-NFPA 70-2018 [ New Section after 702.4 ]****(3) Parallel Sources.**

Where optional standby system sources are interconnected electric power production sources operating in parallel with the normal power source, the standby source shall have a capacity sufficient to supply the maximum load that will be connected or permitted by the load management controls for the stated design duration .

**Statement of Problem and Substantiation for Public Comment**

There has been confusion in the industry for standby systems which operate in parallel with the utility or other interconnected electric power production source. These systems do not utilize transfer equipment and disconnect from any electric power production source(s) upon source loss and provide power to designated standby loads. Public Input 3932 sought to add clarity within Article 710 Stand Alone Systems, but this should be addressed within the capacity requirements for optional standby systems.

**Related Item**

• PI3932 • PC1770 • PC 1773

**Submitter Information Verification**

**Submitter Full Name:** Keith Waters

**Organization:** Schneider Electric

**Affiliation:** Schneider Electric

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Wed Aug 29 22:23:28 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7588-NFPA 70-2018

**Statement:** There are multiple revisions contained in this second revision.

The first is to editorially separate requirements into first level subdivisions for clarity and usability. The first subdivision is (A) General with no revision to existing code text. A new sentence is added to prohibit transfer switches from being reconditioned. This second revision is based on the global impact of public input 2935 which has ramifications that are global in nature and impacts all products referenced in the NEC under the purview of every CMP and does not represent new material. See the "NEMA Policy on Reconditioned Electrical Equipment." Some types of equipment are capable of being reconditioned, then re-evaluated to ensure compliance with the applicable product standards. Other types of equipment (automatic transfer switches) do not lend themselves to reconditioning due to the complexity of the product, the manufacturing process, or the level of knowledge the company performing the reconditioning may need, etc.

The second subdivision is (B) Meter Mounted Transfer Switches. The text is modified to first to correlate with FR 8628 in section 230.82(11) which permits meter-mounted transfer switches to be connected to the supply side of the service disconnecting means. As such, these devices are not "service disconnects", and would therefore not be suitable for use as "service equipment".

The next subdivision is (C) Documentation (correlates with Article 700 and 701) with no revisions to existing code text.

The next subdivision is (D) Inadvertent Interconnection. A new requirement is added to the existing code text to address serious safety concerns when unqualified persons (most likely no qualified persons in dwelling units) may remove covers or equipment doors on transfer equipment. This new requirement mandates that the removal of equipment doors or covers in dwelling units shall not defeat the transfer equipment interlock mechanism.

The next subdivision is (E) Parallel Installation. This is a new requirement that is necessary to recognize electric power production systems that are intended as optional standby systems and are installed to permit operation in parallel with the normal source. Where this occurs, the requirements of both Article 702 and Article 705 must be met. This sentence was deleted in the first draft stage and is modified for clarity.

**Public Comment No. 1319-NFPA 70-2018 [ Section No. 702.4 ]****702.4 Capacity and Rating.****(A) Available Fault Current.**

Optional standby system equipment shall be suitable for the available fault current at its terminals.

**(B) System Capacity.****(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 702.4(B)(2)(a) or (B)(2)(b) in accordance with Article 220 .

(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 Comment**

The reference to Article 220 should be removed. The statements below have been taken from literature provided by major generator manufacturers.

"Diesel engines can suffer damage as a result of misapplication or misuse - namely internal glazing and carbon buildup. This is a common problem in generator sets caused by failure to follow application and operating guidelines - ideally diesel engines should run at least around 60-75% of their maximum rated load."

"Operating a diesel generator set at load levels less than 30 percent of rated output for extended time periods impacts the unit negatively. "

It is important to understand that generator sets are designed to run and, to be specific, they are designed to run with load. This may seem trivial, but loading a generator set properly is essential to availability, healthy engine operation and long engine life.

Requiring generators to be sized by Article 220 can be misused and lead to oversizing. Lighting is required to be sized by table 220.12 which requires unit loads. Receptacles used in health care have no demand factors. Typical sizing of loads using Article 220 can lead to oversizing of genset by 70%.

The reference to Article 220 is also incorrect. Article 220 does not tell the user to comply with Article 702.4(2)(a) or 702.4(2)(b).

**Related Item**

- FR-7606

**Submitter Information Verification**

**Submitter Full Name:** David Hittinger

**Organization:** IEC

**Affiliation:** Independent Electrical Contractors Inc.

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Sun Aug 26 22:48:14 EDT 2018

**Committee:** NEC-P13

## Committee Statement

**Committee Action:** Rejected but see related SR

**Resolution:** [SR-7580-NFPA 70-2018](#)

**Statement:** This second revision recognizes that calculations are permitted to be made in accordance with Article 220 or by another approved method. The reference to “another approved method” was inadvertently omitted in the first draft stage.

**Public Comment No. 194-NFPA 70-2018 [ New Section after 702.4(B)(2) ]****TITLE OF NEW CONTENT**

Type your content here

Exception: For one family dwellings, the standby source shall have capacity to supply all the equipement intended to be operated at one time.

**Statement of Problem and Substantiation for Public Comment**

Article 702 is for optional standby systems. The article definition states these systems are intended to supply power where life safety does not depend on the performance of the system. There area many single family homes where for convenience, the owner wants to be able to select different loads in the home to provide power to, and installs a whole house service rated transfer switch. Many times these are 200-amp services. The actual loads they are concerned with when they are away from home and want to have power to automatically are the furnace for heat and the refrigerator. When they are home they would have the same control over differing loads just like the manual transfer switch would provide. Having a back up generator sized for the load based on a calculation from Article 220 makes these installations economically unfeasible for the owner. Load management system can also add a lot of cost to the owner, and does not provide the flexibility they are looking for. If there was no optional system installed, and the power goes out to the home, nothing works. No furnace for heat, pipes can freeze. A refrigerator full of food can be lost as well as a defrosted freezer which can ruin a hard wood floor or worse. Again, by definition, it is an optional system to be used as the owner deems fit, provided what is installed is done so in a safe and code compliant manner regarding wire size, overcurrent and grounding. It is for these reasons I believe it to be more than reasonable to allow the home owner the ability to install the automatic standby system without the added costs of the much larger generator they will most likely never use.

**Related Item**

• FR-7603

**Submitter Information Verification**

**Submitter Full Name:** Robert Wemmer

**Organization:** Pikes Peak Regional Building Department

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Tue Jul 10 17:30:11 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** [SR-7580-NFPA 70-2018](#)

**Statement:** This second revision recognizes that calculations are permitted to be made in accordance with Article 220 or by another approved method. The reference to "another approved method" was inadvertently omitted in the first draft stage.



## Public Comment No. 1125-NFPA 70-2018 [ Section No. 702.5 ]

### 702.5 Transfer Equipment.

Transfer equipment shall be required for all standby systems subject to the requirements 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.*

~~Transfer switches installed between the utility meter and the meter enclosure shall be listed meter-mounted transfer switches. Meter-mounted transfer switches on the line side of the service disconnecting means shall be suitable for use as service equipment. Meter-mounted transfer switches shall be of the manual type unless rated as determined by 702.4(B)(2).~~

~~Informational Note: For more information, see UL 1008M, Transfer Switch Equipment, Meter Mounted.~~

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.

Transfer equipment shall be suitable for the intended use and designed and installed so as to prevent the inadvertent interconnection of all sources of supply in any operation of the transfer equipment.

## Additional Proposed Changes

| <u>File Name</u>                                                         | <u>Description Approved</u> |
|--------------------------------------------------------------------------|-----------------------------|
| UL_-_1008M_Transfer_Switch_Equipment_Meter_Mounted_Standards_Catalog.pdf |                             |
| _Switches_Transfer_Switches_Meter-mounted_Transfer_Switches_WPXW_-_      |                             |
| _UL_Product_Spec.pdf                                                     |                             |

## Statement of Problem and Substantiation for Public Comment

Requirements related to meter-mounted transfer equipment cannot be added due to the requirements in 90.2(B)(5) which clearly states that "Equipment under exclusive control of an electric utility where such installations

(a) Consist of service drops or service laterals, and associated metering" are not covered by the Code.

It should be noted that the Underwriters Laboratory Product Spec database contains the following statement in product category WPXW Meter Mounted Transfer Switches, "The installation of these devices is intended to be under the exclusive control of the serving utility, and is not considered under the purview of ANSI/NFPA 70, "National Electrical Code." As such, these devices are not considered service equipment". Nearly identical language is contained in the scope of UL-1008M, the outline of investigation for Meter-Mounted Transfer Equipment. Since the UL Standard to which these transfer switches indicates that they are intended to be under the sole jurisdiction of the electric utility, why is it proposed to add them to the NEC?

Since meter-mounted transfer equipment is under the exclusive control of electric utilities, and is not covered by the Code, adding any requirements for them in the Code is futile and will only add confusion for utilities, installers and electrical inspectors.

## Related Public Comments for This Document

| <u>Related Comment</u>                                   | <u>Relationship</u> |
|----------------------------------------------------------|---------------------|
| Public Comment No. 572-NFPA 70-2018 [Section No. 230.82] |                     |
| <u>Related Item</u>                                      |                     |
| • FR-7830                                                |                     |

## Submitter Information Verification

**Submitter Full Name:** Phil Simmons  
**Organization:** Simmons Electrical Services  
**Street Address:**  
**City:**  
**State:**  
**Zip:**

**Submittal Date:** Thu Aug 23 13:52:52 EDT 2018

**Committee:** NEC-P13

### Committee Statement

**Committee  
Action:** Rejected

**Resolution:** All transfer switches on the load side of the "service point" are under the purview of the NEC. Product standards do not make determinations on the purview of the NEC.

Explore UL

STANDARDS

Search Standards

LanguageEnglish

STA

 **UL 1008M**

Transfer Switch Equipment, Meter Mounted

Purchase UL 1008M

DETAILS

|                 |            |                |    |
|-----------------|------------|----------------|----|
| Edition Number: | 2          | SCC Approved:  | -- |
| Edition Date:   | 2015-08-28 | DOD Approved:  | -- |
| Price Code:     | A          | ANSI Approved: | -- |
| Type:           | outline    |                |    |

SCOPE

TABLE OF CONTENTS

1 Scope

- 1.1 These requirements cover automatic and non-automatic (manual) transfer switch equipment, operating at 600 V ac less, and intended for installation in a utility meter base, in ordinary locations only.
- 1.2 These devices are intended for use in optional standby systems only, and are not intended for use in Emergency or Legally Required Standby Systems. These devices are intended for one of the following applications:
- a)

Cord connection of a portable generator to power a premise wiring system, where the neutral (grounded circuit conductor) of the generator is not bonded to ground or the generator frame, and bonding of the neutral (grounded circuit conductor) to ground will occur within the meter base or
- b)

Permanent connection of a stationary generator to power a premise wiring system, where the generator is connected as a non-seperately derived system, where the neutral (grounded circuit conductor) of the generator is not bonded to ground or the generator frame.
- 1.3

These devices are connected between the meter mounting equipment and the electric utility meter, on the line side of the service disconnect. As such, the installation of these devices is intended to be under the exclusive control of the serving utility, and these are not considered under the purview of the National Electrical Code, NFPA 70. Generators and associated wiring connected to the generator terminals of the transfer switch are not considered under the exclusive control of the utility, and are under the purview of NFPA 70.
- 1.4 An automatic transfer switch as covered by these requirements is a device that automatically transfers a common load from a normal supply to an alternate supply in the event of failure of the normal supply, and automatically returns the load to the normal supply when the normal supply is restored. An automatic transfer switch may be provided with a logic control circuit that inhibits automatic operation of the device from either a normal to an alternate supply, or from an alternate to a normal supply when the switch reverts to automatic operation upon loss of power to the load.
- 1.5 A non-automatic transfer switch as covered by these requirements is a device, operated manually by a physical action, or electrically by a remote control, for transferring a common load between a normal and alternate supply.
- 1.6 A transfer switch may incorporate overcurrent protection for the main power circuits.
- 1.7 These requirements only cover transfer switches which are completely enclosed when installed in a meter base in conjunction with the electrical utility meter.
- 1.8 Transfer switches are rated in amperes and are considered to be acceptable for total system transfer, which includes control of motors, electric-heating loads, and transformer loads.

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## UL PRODUCT CATEGORY

### [Switches] (Transfer Switches) Meter-mounted Transfer Switches, WPXW

See General Information for Transfer Switches

#### USE

This category covers transfer switches rated 600 V or less, intended for mounting in a meter base, on the line side of the service disconnect switch. These transfer switches are intended to transfer the loads connected to the load side of the meter from the normal utility supply to an alternate supply, consisting of a portable or stationary generator that is temporarily cord connected or permanently connected to the meter-mounted transfer switch. These devices are not intended for use in emergency systems or in legally required standby systems.

The installation of these devices is intended to be under the exclusive control of the serving utility, and is not considered under the purview of ANSI/NFPA 70, "National Electrical Code." As such, these devices are not considered service equipment.

#### PRODUCT IDENTITY

The following product identity appears on the product:

Meter-mounted Transfer Switch

#### ADDITIONAL INFORMATION

For additional information, see Transfer Switches ([WPTZ](#)) and Electrical Equipment for Use in Ordinary Locations ([AALZ](#)).

#### REQUIREMENTS

The basic requirements used to investigate products in this category are contained in [UL 1008M](#), "Outline of Investigation for Transfer Switch Equipment, Meter Mounted."

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**Public Comment No. 1522-NFPA 70-2018 [ Section No. 702.5 ]****702.5** Transfer Equipment.

Transfer equipment shall be required for all standby systems subject to the requirements 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.*

Transfer switches installed between the utility meter and the meter enclosure shall be listed meter-mounted transfer switches. Meter-mounted transfer switches on the line side of the service disconnecting means shall be suitable for use as service equipment. Meter-mounted transfer switches shall be of the manual type unless rated as determined by 702.4(B)(2).

Informational Note: For more information, see UL 1008M, *Transfer Switch Equipment, Meter Mounted*.

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.

Transfer equipment shall be suitable for the intended use and designed and installed so as to prevent the inadvertent interconnection of all sources of supply in any operation of the transfer equipment.

Informational Note: Installation of the meter-mounted transfer switch shall be approved by both the AHJ and the local utility prior to this device is interconnected with the utility's electrical distribution system.

**Statement of Problem and Substantiation for Public Comment**

The EL&P Committee has a major concern with the use of the Meter-Mounted Transfer Switches. The piece of equipment can be easily mounted without the approval of the AHJ. Furthermore, due to the ease of installation, it makes energy theft a relatively simple task. Due to this concern, the utilities should be involved with the approval and installation of these devices on the electrical system. Therefore, an informational note should be included to address these concerns. This item should either be addressed in the NESC or require utility approval before installing these devices on the electrical system. Finally, the installation can only be performed with the support of the utility since the meter has to be removed and installed to even allow for the installation to be performed.

**Related Item**

- 702.5

**Submitter Information Verification**

**Submitter Full Name:** Robert Jordan

**Organization:** Alabama Power Company

**Affiliation:** EL&P

**Street Address:**

**City:**

**State:**

**Zip:**

**Submission Date:** Wed Aug 29 10:04:57 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected

**Resolution:** The proposed informational note contains mandatory requirements and is in violation of the NEC style manual. This information it is not necessary as it is well understood. All parts of electrical installations must be approved by the AHJ. Any type of device interconnected with the utility meter would also have to be approved by the utility.



## Public Comment No. 1770-NFPA 70-2018 [ Section No. 702.5 ]

### 702.5 Transfer Equipment.

Transfer equipment shall be required for all standby systems subject to the requirements of this article and for which an electric utility supply is either the normal or standby source.

*Exception 1: 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.*

*Exception 2: Optional standby sources that operate in parallel with the normal source shall be permitted without transfer equipment where the optional standby sources and supplied loads have been automatically disconnected from the electric power production and distribution network.*

Transfer switches installed between the utility meter and the meter enclosure shall be listed meter-mounted transfer switches. Meter-mounted transfer switches on the line side of the service disconnecting means shall be suitable for use as service equipment. Meter-mounted transfer switches shall be of the manual type unless rated as determined by 702.4(B)(2).

Informational Note: For more information, see UL 1008M, *Transfer Switch Equipment, Meter Mounted*.

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.

Transfer equipment shall be suitable for the intended use and designed and installed so as to prevent the inadvertent interconnection of all sources of supply in any operation of the transfer equipment.

### Statement of Problem and Substantiation for Public Comment

There has been confusion in the industry for standby systems which operate in parallel with the utility or other interconnected electric power production source. These systems do not utilize transfer equipment and disconnect from any electric power production source(s) upon source loss and provide power to designated standby loads. Public Input 3479 sought to add clarity by the addition of a reference to Article 705. A new exception to this section will address the concern of this public input and provide the guidance needed for these systems.

#### Related Item

• PI3479 • PC1768 • PC 1773

### Submitter Information Verification

**Submitter Full Name:** Keith Waters

**Organization:** Schneider Electric

**Affiliation:** Schneider Electric

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Wed Aug 29 22:29:06 EDT 2018

**Committee:** NEC-P13

### Committee Statement

**Committee Action:** Rejected but see related SR

**Resolution:** [SR-7588-NFPA 70-2018](#)

**Statement:** There are multiple revisions contained in this second revision.

The first is to editorially separate requirements into first level subdivisions for clarity and usability. The first subdivision is (A) General with no revision to existing code text. A new sentence is added to prohibit transfer switches from being reconditioned. This second revision is based on the global impact of public input 2935 which has ramifications that are global in nature and impacts all products referenced in the NEC under the

purview of every CMP and does not represent new material. See the “NEMA Policy on Reconditioned Electrical Equipment.” Some types of equipment are capable of being reconditioned, then re-evaluated to ensure compliance with the applicable product standards. Other types of equipment (automatic transfer switches) do not lend themselves to reconditioning due to the complexity of the product, the manufacturing process, or the level of knowledge the company performing the reconditioning may need, etc.

The second subdivision is (B) Meter Mounted Transfer Switches. The text is modified to first to correlate with FR 8628 in section 230.82(11) which permits meter-mounted transfer switches to be connected to the supply side of the service disconnecting means. As such, these devices are not “service disconnects”, and would therefore not be suitable for use as “service equipment”.

The next subdivision is (C) Documentation (correlates with Article 700 and 701) with no revisions to existing code text.

The next subdivision is (D) Inadvertent Interconnection. A new requirement is added to the existing code text to address serious safety concerns when unqualified persons (most likely no qualified persons in dwelling units) may remove covers or equipment doors on transfer equipment. This new requirement mandates that the removal of equipment doors or covers in dwelling units shall not defeat the transfer equipment interlock mechanism.

The next subdivision is (E) Parallel Installation. This is a new requirement that is necessary to recognize electric power production systems that are intended as optional standby systems and are installed to permit operation in parallel with the normal source. Where this occurs, the requirements of both Article 702 and Article 705 must be met. This sentence was deleted in the first draft stage and is modified for clarity.



## Public Comment No. 219-NFPA 70-2018 [ Section No. 702.5 ]

### 702.5 Transfer Equipment.

Transfer equipment shall be required for all standby systems subject to the requirements 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.*

Transfer switches installed between the utility meter and the meter enclosure shall be listed meter-mounted transfer switches. Meter-mounted transfer switches ~~on the line side of the service disconnecting means~~ shall be suitable for use as service equipment. ~~Meter-mounted transfer switches shall be~~ of the manual type unless rated as determined by 702.4(B)(2).

Informational Note: For more information, see UL 1008M, *Transfer Switch Equipment, Meter Mounted*.

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.

Transfer equipment shall be suitable for the intended use and designed and installed so as to prevent the inadvertent interconnection of all sources of supply in any operation of the transfer equipment.

## Statement of Problem and Substantiation for Public Comment

Revisions processed as part of FR-7830 (Section 702.5) would require meter-mounted transfer switches to be "suitable for use as service equipment". As noted in Section 230.82(11) (FR-8628), meter-mounted transfer switches are permitted to be connected to the supply side of the service disconnecting means. As such, these devices are NOT "service disconnects", and would therefore not be suitable for use as "service equipment". Requiring that these devices be suitable for service equipment would result in the need to bond the neutral to ground in the meter mounted transfer switch, resulting in multiple bonding points. If multiple bonding points are to be avoided, the existing service equipment would need to be modified and would no longer be the service disconnect. This is not the intent of the meter-mounted transfer switch.

To clarify that the meter-mounted transfer switch is not service equipment, a marking is added to the new 230.82(11), similar to wording used in 230.82(3), that states "NOT SERVICE EQUIPMENT". Lastly, Section 230.94 is revised with a new Exception, similar to Exception 1, stating that the meter-mounted transfer switch is permitted on the supply side of the (service) overcurrent device.

## Related Public Comments for This Document

| <u>Related Comment</u>                                                   | <u>Relationship</u> |
|--------------------------------------------------------------------------|---------------------|
| <a href="#">Public Comment No. 218-NFPA 70-2018 [Section No. 230.94]</a> |                     |
| <a href="#">Public Comment No. 217-NFPA 70-2018 [Section No. 230.82]</a> |                     |
| <a href="#">Public Comment No. 217-NFPA 70-2018 [Section No. 230.82]</a> |                     |
| <a href="#">Public Comment No. 218-NFPA 70-2018 [Section No. 230.94]</a> |                     |

### Related Item

- FR 7830 • FR 8628

## Submitter Information Verification

**Submitter Full Name:** Robert Osborne  
**Organization:** UL LLC  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Mon Jul 16 13:05:10 EDT 2018  
**Committee:** NEC-P13

## Committee Statement

**Committee** Rejected but see related SR

**Action:**

**Resolution:** [SR-7588-NFPA 70-2018](#)

**Statement:** There are multiple revisions contained in this second revision.

The first is to editorially separate requirements into first level subdivisions for clarity and usability. The first subdivision is (A) General with no revision to existing code text. A new sentence is added to prohibit transfer switches from being reconditioned. This second revision is based on the global impact of public input 2935 which has ramifications that are global in nature and impacts all products referenced in the NEC under the purview of every CMP and does not represent new material. See the "NEMA Policy on Reconditioned Electrical Equipment." Some types of equipment are capable of being reconditioned, then re-evaluated to ensure compliance with the applicable product standards. Other types of equipment (automatic transfer switches) do not lend themselves to reconditioning due to the complexity of the product, the manufacturing process, or the level of knowledge the company performing the reconditioning may need, etc.

The second subdivision is (B) Meter Mounted Transfer Switches. The text is modified to first to correlate with FR 8628 in section 230.82(11) which permits meter-mounted transfer switches to be connected to the supply side of the service disconnecting means. As such, these devices are not "service disconnects", and would therefore not be suitable for use as "service equipment".

The next subdivision is (C) Documentation (correlates with Article 700 and 701) with no revisions to existing code text.

The next subdivision is (D) Inadvertent Interconnection. A new requirement is added to the existing code text to address serious safety concerns when unqualified persons (most likely no qualified persons in dwelling units) may remove covers or equipment doors on transfer equipment. This new requirement mandates that the removal of equipment doors or covers in dwelling units shall not defeat the transfer equipment interlock mechanism.

The next subdivision is (E) Parallel Installation. This is a new requirement that is necessary to recognize electric power production systems that are intended as optional standby systems and are installed to permit operation in parallel with the normal source. Where this occurs, the requirements of both Article 702 and Article 705 must be met. This sentence was deleted in the first draft stage and is modified for clarity.



## Public Comment No. 679-NFPA 70-2018 [ Section No. 702.5 ]

### 702.5 Transfer Equipment.

Transfer equipment shall be required for all standby systems subject to the requirements 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 Transfer switches installed between the utility meter and the meter enclosure shall be listed meter - mounted transfer switches. Meter - mounted transfer switches installed on the line side of the service disconnecting means shall be suitable for use as service equipment. ~~Meter-mounted transfer switches shall be of the manual type unless rated as determined by 702.4(B)(2) comply with Article 230 Part V Service Equipment - General and Section 702.4 Capacity and Rating .~~

Informational Note: For more information, see UL 1008M, *Transfer Switch Equipment, Meter Mounted*.

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.

Transfer equipment shall be suitable for the intended use and designed and installed so as to prevent the inadvertent interconnection of all sources of supply in any operation of the transfer equipment.

## Statement of Problem and Substantiation for Public Comment

The suggested changes are intended to accurately incorporate NFPA 70 articles that clarify intent and design requirements pertaining to equipment mounted that engages the meter socket and provides a new mount for the Utility meter. This equipment is between the utility line and the service disconnect means, located typically in the existing distribution panel. Article 230 Part V is made up of Section 230.62 which states "Energized parts of service equipment shall be enclosed as specified in 230.62(A) or guarded as in 230.62(B)." and Section 230.66 Marking which states "Service Equipment rated at 1000 volts or less shall be marked to identify it as being suitable for use as service equipment. All service equipment shall be listed or field labeled. Individual meter socket enclosures shall not be considered service equipment but shall be listed and rated for the voltage and ampacity of the service." Article section 702.4 Capacity and Rating which 702.4(A) requires "Optional standby system shall be suitable for the maximum available short circuit current at its terminals." 702.4(B) addresses System Capacity, 702.4(B)(1) Manual Transfer Equipment, and 702.4(B)(2) Automatic Transfer Equipment.

### Related Item

- FR-7830-NFPA 70-2018

## Submitter Information Verification

**Submitter Full Name:** Greg Marchand  
**Organization:** Briggs & Stratton  
**Affiliation:** Portable Generator Manufactures Association (PGMA)  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Wed Aug 15 11:38:14 EDT 2018  
**Committee:** NEC-P13

## Committee Statement

**Committee Action:** Rejected  
**Resolution:** Meter mounted transfer switches are now permitted on the supply side of the service disconnecting means. See the action of FR 8628 in section 230.82(11) which permits meter-mounted transfer switches to be connected to the supply side of the service disconnecting means. As such, these devices are not "service disconnects", and would therefore not be suitable for use as "service equipment".

**Public Comment No. 9-NFPA 70-2018 [ Section No. 702.5 ]****702.5 Transfer Equipment.**

Transfer equipment shall be required for all standby systems subject to the requirements 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.*

Transfer switches installed between the utility meter and the meter enclosure shall be listed meter-mounted transfer switches. Meter-mounted transfer switches on the line side of the service disconnecting means shall be suitable for use as service equipment. Meter-mounted transfer switches shall be of the manual type unless rated as determined by 702.4(B)(2).

Informational Note: For more information, see UL 1008M, *Transfer Switch Equipment, Meter Mounted*.

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.

Transfer equipment shall be suitable for the intended use and designed and installed so as to prevent the inadvertent interconnection of all sources of supply in any operation of the transfer equipment. In dwelling units, the removal of equipment doors or covers shall not result in defeating the transfer equipment interlock mechanism.

**Statement of Problem and Substantiation for Public Comment**

The UL 1008 standard for transfer equipment has requirements that prevent the removal of equipment doors or panel covers from defeating the interlocking mechanism. A common installation practice for dwelling units is the installation of an UL 67 approved panelboard interlock kit to the cover of a dwelling unit panelboard in place of transfer equipment. Unfortunately, if the cover is removed, the interlocking means is defeated and can cause the inadvertent interconnection of all supplies of power. The Public comment resolves the concerns that the code panel had with commercial and industrial applications as it applied to PI-8 and narrows the scope to only dwelling units. Since a homeowner is not a qualified person, the installation of transfer equipment should be required.

**Related Item**

- PI 8 NFPA 70-2017

**Submitter Information Verification**

**Submitter Full Name:** Brian Baughman

**Organization:** Generac Power Systems Inc

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Mon Jun 25 14:30:14 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7600-NFPA 70-2018

**Statement:** A new requirement for listing is added to the existing code text to ensure that transfer equipment is designed and installed to prevent the inadvertent interconnection of all sources of supply.



## Public Comment No. 986-NFPA 70-2018 [ Section No. 702.5 ]

### 702.5 Transfer Equipment.

Transfer equipment shall be required for all standby systems subject to the requirements 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.*

Transfer switches installed between the utility meter and the meter enclosure shall be listed meter-mounted transfer switches. Meter-mounted transfer switches on the line side of the service disconnecting means shall be suitable for use as service equipment. Meter-mounted transfer switches shall be of the manual type unless rated as determined by 702.4(B)(2).

Informational Note: For more information, see UL 1008M, *Transfer Switch Equipment, Meter Mounted*.

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.

Transfer equipment shall be suitable for the intended use and designed and installed so as to prevent the inadvertent interconnection of all sources of supply in any operation of the transfer equipment.

Transfer equipment shall not be permitted to be reconditioned.

## Additional Proposed Changes

| <u>File Name</u>                           | <u>Description Approved</u> |
|--------------------------------------------|-----------------------------|
| NEMA-Position_Refubishing_on_ElecEquip.pdf |                             |

## Statement of Problem and Substantiation for Public Comment

This public comment is submitted by an NEC Correlating Committee appointed task group to address the global impacts of PI 2935. This PI would have required that "Reconditioned Equipment" be "listed as "reconditioned" and the "original listing marks removed". This PI has ramifications that are global in nature and impacts all products referenced in the NEC under the purview of every CMP.

This proposed new section is safety-driven and is necessary to prevent the reconditioning of products that cannot be reconditioned.

This public comment is based on the global impact of public input 2935 and does not represent new material.

The "NEMA Policy on Reconditioned Electrical Equipment" is attached to this public comment. See also global public comment 979.

The substantiation for global public comment 979 is provided below:

Public Comment No. 979-NFPA 70-2018 [Global Input]

This Public Comment is submitted on behalf of a task group appointed by the NEC® Correlating Committee. This Task Group was appointed to review the use of refurbished equipment throughout the NEC®. Task Group members are Jim Dollard, Robert Osborne, Jim Pierce, and David Williams. This task group has been charged with reviewing Public Input (PI) 2935 which was resolved by CMP-1 during the first draft stage. This PI would have required that "Reconditioned Equipment" be "listed as "reconditioned" and the "original listing marks removed". This PI has ramifications that are global in nature and impacts all products referenced in the NEC under the purview of every CMP.

Task group members noted that some types of equipment are capable of being reconditioned, then re-evaluated to ensure compliance with the applicable product standards. Other types of equipment do not lend themselves to reconditioning due to the complexity of the product, the manufacturing process, or the level of knowledge the company performing the reconditioning may need, etc.

The "NEMA Policy on Reconditioned Electrical Equipment" details the following aspects of Reconditioning of Electrical Equipment:

- Fundamental Tenets for Reconditioning Electrical Equipment
- Electrical Infrastructure and Worker Safety

- Integrity of Reconditioned Equipment
- Listing or Certification Marks
- UL Guidance on the UL Mark
- Components or Assemblies Not Suitable For Reconditioning (Appendix A)
- Components or Assemblies Which May Be Reconditioned (Appendix B)

A PDF copy of this NEMA policy is attached and may also be found on the internet at the following URL:  
[https://www.nema.org/Policy/Documents/NEMA-Position\\_Refubishing%20on%20ElecEquip.pdf](https://www.nema.org/Policy/Documents/NEMA-Position_Refubishing%20on%20ElecEquip.pdf)

NEC® Section 110.21(A)(2), which was new for the 2017 Edition of the NEC®, included marking requirements for “Reconditioned Equipment”. PI 2935 would have required that “Reconditioned Equipment” be “listed as “reconditioned” and the “original listing marks removed”. CMP 1 resolved this PI. This Task Group appointed by the NEC® Correlating Committee has developed a number of public comments, based on the products identified in the referenced NEMA document, to determine whether or not equipment can be reconditioned, and if reconditioned, what additional requirements apply.

While several public comments were developed for specific equipment by this task group, not all equipment was addressed (neither was all the equipment noted in the NEMA Policy document addressed). This Global Public Comment requests each CMP to review the products required to be listed under their purview and determine whether reconditioning should be permitted. It is recommended that the NEMA Policy document be used as one of the guidelines in making this determination. It is also recommended that one of the following options/examples be chosen for listed equipment:

Option 1 - Equipment NOT suitable for Reconditioning (EXAMPLE):

695.10 Listed Equipment. Diesel engine fire pump controllers, electric fire pump controllers, electric motors, fire pump power transfer switches, foam pump controllers, and limited service controllers shall be listed for fire pump service. [20:9.5.1.1, 10.1.2.1, 12.1.3.1]

Fire pump controllers and transfer switches shall not be permitted to be reconditioned.

Option 2 - Equipment which MAY BE suitable for Reconditioning (EXAMPLE):

408.8 Reconditioned Equipment.

(A) Panelboards. The use of reconditioned panelboards shall comply with (1) and (2):

(1) Industrial and commercial panelboards shall be permitted to be reconditioned. Reconditioned equipment shall be listed as “reconditioned” and the original listing mark removed.

(2) Panelboards installed in dwelling units shall not be permitted to be reconditioned.

(B) Switchboards and Switchgear. Low voltage switchgear, medium voltage switchgear and switchboards shall be permitted to be reconditioned. Reconditioned equipment shall be listed as “reconditioned” and the original listing mark removed.

Note that equipment where no specific guidance is provided would be permitted to be reconditioned and would only be required to meet the marking requirements in 110.21(A)(2).

## Related Public Comments for This Document

| <u>Related Comment</u>                                                             | <u>Relationship</u> |
|------------------------------------------------------------------------------------|---------------------|
| <a href="#">Public Comment No. 979-NFPA 70-2018 [Global Input]</a>                 |                     |
| <a href="#">Public Comment No. 980-NFPA 70-2018 [New Section after 240.87(B)]</a>  |                     |
| <a href="#">Public Comment No. 981-NFPA 70-2018 [New Section after 240.61]</a>     |                     |
| <a href="#">Public Comment No. 982-NFPA 70-2018 [New Section after 240.101(B)]</a> |                     |
| <a href="#">Public Comment No. 983-NFPA 70-2018 [Section No. 695.10]</a>           |                     |
| <a href="#">Public Comment No. 984-NFPA 70-2018 [Section No. 700.5(C)]</a>         |                     |
| <a href="#">Public Comment No. 985-NFPA 70-2018 [Section No. 701.5(C)]</a>         |                     |
| <a href="#">Public Comment No. 987-NFPA 70-2018 [New Section after 408.7]</a>      |                     |
| <a href="#">Public Comment No. 979-NFPA 70-2018 [Global Input]</a>                 |                     |
| <a href="#">Public Comment No. 980-NFPA 70-2018 [New Section after 240.87(B)]</a>  |                     |
| <a href="#">Public Comment No. 981-NFPA 70-2018 [New Section after 240.61]</a>     |                     |
| <a href="#">Public Comment No. 982-NFPA 70-2018 [New Section after 240.101(B)]</a> |                     |
| <a href="#">Public Comment No. 983-NFPA 70-2018 [Section No. 695.10]</a>           |                     |
| <a href="#">Public Comment No. 984-NFPA 70-2018 [Section No. 700.5(C)]</a>         |                     |
| <a href="#">Public Comment No. 985-NFPA 70-2018 [Section No. 701.5(C)]</a>         |                     |
| <a href="#">Public Comment No. 987-NFPA 70-2018 [New Section after 408.7]</a>      |                     |

### Related Item

- PI 2935

## Submitter Information Verification

**Submitter Full Name:** James Dollard  
**Organization:** IBEW Local Union 98  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Tue Aug 21 09:55:03 EDT 2018  
**Committee:** NEC-P13

## Committee Statement

**Committee Action:** Rejected but see related SR  
**Resolution:** SR-7588-NFPA 70-2018  
**Statement:** There are multiple revisions contained in this second revision.

The first is to editorially separate requirements into first level subdivisions for clarity and usability. The first subdivision is (A) General with no revision to existing code text. A new sentence is added to prohibit transfer switches from being reconditioned. This second revision is based on the global impact of public input 2935 which has ramifications that are global in nature and impacts all products referenced in the NEC under the purview of every CMP and does not represent new material. See the "NEMA Policy on Reconditioned Electrical Equipment." Some types of equipment are capable of being reconditioned, then re-evaluated to ensure compliance with the applicable product standards. Other types of equipment (automatic transfer switches) do not lend themselves to reconditioning due to the complexity of the product, the manufacturing process, or the level of knowledge the company performing the reconditioning may need, etc.

The second subdivision is (B) Meter Mounted Transfer Switches. The text is modified to first to correlate with FR 8628 in section 230.82(11) which permits meter-mounted transfer switches to be connected to the supply side of the service disconnecting means. As such, these devices are not "service disconnects", and would therefore not be suitable for use as "service equipment".

The next subdivision is (C) Documentation (correlates with Article 700 and 701) with no revisions to existing code text.

The next subdivision is (D) Inadvertent Interconnection. A new requirement is added to the existing code text to address serious safety concerns when unqualified persons (most likely no qualified persons in dwelling units) may remove covers or equipment doors on transfer equipment. This new requirement mandates that the removal of equipment doors or covers in dwelling units shall not defeat the transfer equipment interlock mechanism.

The next subdivision is (E) Parallel Installation. This is a new requirement that is necessary to recognize electric power production systems that are intended as optional standby systems and are installed to permit operation in parallel with the normal source. Where this occurs, the requirements of both Article 702 and Article 705 must be met. This sentence was deleted in the first draft stage and is modified for clarity.

# **NEMA Policy on Reconditioned Electrical Equipment**

## **Executive Summary:**

The option of reconditioning existing equipment (instead of purchasing new equipment) exists today. Proper electrical equipment reconditioning provides a means to extend the life of electrical products as well as an opportunity in some cases to update installed equipment with the latest performance and safety features. However, not all components of the electrical infrastructure are candidates for reconditioning.

There are a number of precautions that must be adhered to when reconditioning electrical equipment if that equipment is to operate safely and with acceptable performance. Those precautions are discussed below and include the use of design qualified parts, testing to industry-recognized safety standards, original manufacturer specification and/or recommendations, when possible, and reconditioning performed by qualified personnel. The integrity of reconditioned electrical equipment must be established by documenting and demonstrating that component replacement has not compromised the manufacturer's original specifications and accepted industry standards.

The third party certification mark must be removed or obliterated from reconditioned electrical products to indicate that an evaluation of the reconditioning process or reconditioned product has not been conducted by the original third party.

As guidance, Appendix B provides a list of electrical products and components that are considered by NEMA suitable for reconditioning and Appendix A provides a list of electrical products considered not suitable for reconditioning. Medical Imaging Equipment is specifically not addressed by this policy (reference MITA 1, Good Refurbishment Practices for Medical Imaging Equipment).

## **Introduction:**

The U.S. electrical industry includes discussions on implementing new technologies to enhance existing electrical infrastructure. Further, sustainability and safeguarding the environment are growing in importance. In the midst of this is the option for reconditioning existing equipment. Paramount in all this is the fundamental priority that all electrical systems operate while safe-guarding personnel and infrastructure from potential hazards (electrical, mechanical, fire, etc.). This forms the basis for the NEMA position on reconditioning electrical products.

Given that electrical systems are diverse in design, function, and application, not all components of the electrical infrastructure are candidates for reconditioning.

## **Definition:**

Reconditioning: the process of restoring electromechanical systems, equipment, apparatus or components to operating conditions as recommended by the

manufacturer's instructions, using only design qualified parts. Reverse engineered parts (designs copied from existing parts by other manufacturers) are not considered to be "design qualified parts" unless specifically design verified under applicable Standards. Electrical industry practitioners and other organizations may also use the following terms/words to describe the process of reconditioning: remanufacturing, refurbishing, recycling, repairing, restoring, rebuilding, reengineering, and reusing.

In addition to design considerations, it is often impossible to obtain the service records, application environment, and operation parameters of all electrical components. Not having access to such information could have an adverse impact on the final safety and reliability of refurbished or reconditioned equipment. While NEMA supports the reconditioning of some electrical equipment, the components listed in Appendix A are not recommended for reconditioning, unless otherwise indicated by the original manufacturer. Normal servicing of equipment that remains within a facility should not be considered reconditioning or refurbishing. For electrical components suitable for reconditioning listed in Appendix B, the following fundamental tenets have been established.

### **Fundamental Tenets for Reconditioning Electrical Equipment**

- Reconditioning electrical equipment may be a viable option for extending operational lifetime of equipment and enhancing equipment with additional features.
- Electrical equipment reconditioning activity must be based on available guidance documentation from the Original Equipment Manufacturer, or industry-developed standards. Where any conflict in guidance is noted between the OEM and industry standards, the OEM guidance should take precedence.
- Electrical equipment must be reconditioned and qualified to an industry-developed standard that ensures equipment is in a usable and safe operating condition. An industry-developed standard is a widely agreed upon rule, set of rules, procedures or requirements for a product, assembly or process which are developed by members or organizations of an aggregate of manufacturing and technically productive enterprises in a particular field. Products deemed to be candidates for reconditioning must be reconditioned and qualified to industry standards containing the most relevant and critical design aspects, testing criteria and manufacturing specifications when the item was built.
- Reconditioning work must be performed by qualified personnel.
- Electrical equipment that has been exposed to adverse conditions, such as fire, water damage, etc., may not be suitable for reconditioning.
- A comprehensive assessment of the electrical equipment being considered for reconditioning with service records, application, environment, service life, and operating parameters is critical before deciding to pursue reconditioning of the electrical equipment and system. Trained, skilled technicians should be able to assess whether a device or system is suitable for reconditioning through physical inspection and test.
- Appendix A provides guidance on which components or assemblies of the electrical system are not suitable for reconditioning because they may pose a

hazard. Appendix B provides guidance on the components or assemblies are suitable for reconditioning.

- Reconditioning electrical equipment must utilize electrical product safety standards as they contain design aspects, testing criteria and manufacturing specifications to ensure a given product will function as intended. These requirements are established to deliver a usable and safe operating condition as a key component of intended product functionality.

## **Electrical Infrastructure and Worker Safety**

Electrical equipment that is properly installed, tested, maintained, and operated will provide reliable power as well as protect the electrical infrastructure. The reconditioning of electrical equipment requires the electrical industry, in collaboration with manufacturers, to establish performance specifications and accepted industry standards to help ensure safe and reliable equipment that help protect our electrical infrastructure so workers and users can continue to benefit from a safe and effective electrical system. Reconditioning standards must include prescriptive actions and performance requirements that result in equipment that complies with standards that include but are not limited to CSA, IEC, IEEE, NEC, OSHA, NFPA 70E, NFPA 70B, NETA ATS, NETA MTS, and EASA AR100 for example. Qualified personnel must possess the knowledge of how to assess equipment condition, potential hazards, and specifications to accurately determine the suitability for reconditioning. A safe and reliable electrical infrastructure that can be safely maintained is dependent on compliance with manufacturers' instructions, qualified workers, proper maintenance, and accepted industry standards for reconditioning activities.

## **Electrical Equipment Reliability, Performance and Safety**

Proper electrical equipment reconditioning provides a means to extend the life of electrical products as well as an opportunity to update installed equipment with the latest performance and safety features. Establishing well defined guidelines for those performing the reconditioning activity, based on original manufacturer's requirements, creates a solid foundation for the electrical industry and users. It is paramount that reconditioned electrical equipment be reliable in not only providing power, but also in safely performing its intended function as part of a safe operating electrical system. Understanding the environment, electrical load characteristics and historical maintenance performed on equipment being considered for reconditioning are all important parts of an assessment for reconditioning that can have a significant bearing on reliability, performance and safety. The electrical equipment manufacturer is the foremost authority on the design, performance and intended safe application of their product. Reconditioned electrical equipment must not compromise the reliability, performance, safe operation, or maintenance of the electrical system.

## **Integrity of Reconditioned Equipment**

Reconditioned electrical equipment must comply with all applicable standards at the time the equipment was initially built as a minimum as well as the original manufacturer's performance requirements in accordance with the nameplate markings and ratings. Replacement parts shall meet the design criteria (form, fit, and function) for the device to perform its intended function and provide safe operation. Replacement parts shall not include counterfeit parts (i.e., parts that have been misrepresented to be an authorized item of the legally authorized source.) Equipment shall operate safely in its intended application after reconditioning occurs. Care must be taken to ensure specific operations such as timing, sequencing, control, transfer, etc. continue to function in the manner originally intended, unless changes are specified during the reconditioning process. The integrity of reconditioned electrical equipment must be established by documenting and demonstrating that component replacement and performance changes have not compromised the manufacturer's specifications and accepted industry standards.

### **Listing or Certification Marks**

NEMA members manufacture products that are more than likely to be evaluated as part of a third party certification program to nationally recognized safety standards. These products can be marked with a listing or certification mark when the products are manufactured and shipped from the factory. The organization that reconditions the product is responsible for adhering to the guidelines from the issuing agency authorizing the mark to determine if the mark can remain on the product after reconditioning. The organization that reconditions is responsible for any actions necessary for the mark to remain on the product (analysis, testing, etc.). Otherwise, reconditioned electrical products must have their mark removed or obliterated to indicate that an evaluation of the reconditioning process has not been conducted by the original third party.

The organization that reconditions the product is additionally responsible for applying a mark or seal that indicates that the equipment has been reconditioned. This mark must provide traceability to the reconditioning organization in the event that it is necessary to determine the details of who reconditioned the equipment and the report on what was completed during this process.

There are a number of NEMA products that are not allowed to be reconditioned due to the inherent safety characteristics and requirements for those products to be evaluated according to a regular follow up program to evaluate the safety performance requirements as a condition of maintaining the listing or certification mark. This process cannot be applied to reconditioned electrical products since these are normally destructive tests and sample sets of reconditioned products are not possible due to limited quantities or ratings of specific devices.

### **UL Guidance on the UL Mark**

When the manufacturer places the UL Mark on the product at the factory, it is their attestation that the product complies with the applicable requirements. Unless there is further oversight or review/inspection (field inspection) UL cannot ascertain that the

product continues to comply with all requirements should field repairs, modifications or component replacements be made to the product.

Obviously there is little control over what manufacturers will or can do to equipment which left the factory with a certification mark. UL has created rebuilt categories where the reconditioning of product is done in an organized consistent manner under the supervision of UL's FUS (Follow-Up Services) field representatives. In these cases the first action conducted with equipment being rebuilt is the removal of the initial certification mark (if provided). Upon completion of the reconditioning, in accordance with the surveillance document, the manufacturer is permitted to affix a mark which clearly identifies the product as reconditioned.

Cases where a reconditioner is instructed to NOT remove any certification mark will result in confusion. Clearly such equipment in the field, which has undergone modification or reconditioning, is ineligible to bear a mark which designates a compliance with a certification standard.

# APPENDIX A

## COMPONENTS OR ASSEMBLIES NOT SUITABLE FOR RECONDITIONING\*

Adjustable speed drives  
Arc fault circuit breakers  
Ballasts  
Busway (mylar wrapped)  
Busway (powder coated)  
Cable tray  
Cast resin transformers  
Components containing semiconductors and transistors  
Control transformers  
Dry type transformers  
Electrical Connectors  
Electrical submetering equipment  
Electrical vehicle supply equipment  
Enclosed switches  
Fire detectors, smoke alarms, co detectors  
Fire pump controllers  
Flexible and extension cords  
Flexible conduit  
Ground fault circuit breakers  
High performance wire and cable  
Lighting controls  
Liquid filled transformers  
Low and medium voltage fuse holders  
Low and medium voltage non-renewable fuses  
Low voltage power circuit breaker electronic trip units  
Luminaires  
Meters (electromechanical, electronic or digital)  
Meter sockets  
Molded case circuit breakers  
Non-Metallic conduit, tubing, raceways and fittings  
Non-metallic surface raceways and fittings  
Outlet and junction boxes  
Overload relays  
Pin and sleeve plugs receptacles and connectors  
Power and control cable  
Protective relays (electronic or digital)  
Residential panel boards  
Solid state contactors and starters  
Solid state drives  
Strut type channel raceway  
Surface metal raceways and fittings  
Surge protective devices  
Transfer switches  
Wire or cable  
Wireway  
Wiring devices

\*The components or products listed above are not recommended for reconditioning, unless otherwise indicated by the original manufacturer.

## **APPENDIX B**

### **COMPONENTS OR ASSEMBLIES WHICH MAY BE RECONDITIONED**

Electromechanical protective relays, and current transformers

High voltage circuit breakers

Industrial and commercial panel boards

Low and medium voltage power circuit breakers

Low and medium voltage replaceable link fuses

Low voltage switchgear

Manual and magnetic controllers

Medium voltage switchgear

Metallic conduit, tubing, raceways and fittings

Motor control centers

Motors

Switchboards

Uninterruptible Power Supply Equipment

**Public Comment No. 7-NFPA 70-2018 [ Section No. 702.6 [Excluding any Sub-Sections] ]**

Audible and visual signal devices shall be ~~provided~~ permitted , where practicable, for the following purposes specified in 702.6(A) and (B).

**Statement of Problem and Substantiation for Public Comment**

The Public Comment addresses the committee statement to resolved PI-279 that the requirements in 702.6 are permitted, but not required. The Public Comment changes the term "shall be provided" to "shall be permitted" to align the code language with the requirements of 90.5(B) for editorial clarity.

**Related Item**

- PI 279 NFPA 70-2017

**Submitter Information Verification**

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**Submittal Date:** Mon Jun 25 14:28:10 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected

**Resolution:** The existing code text it is clear. Audible and visual signal devices are required where practicable. The proposed revision would make them optional.



## Public Comment No. 41-NFPA 70-2018 [ Section No. 702.7 ]

### 702.7 Signs.

#### (A) Standby.

A sign shall be placed at the service-entrance equipment for commercial and industrial installations, that indicates the type and location of each on-site optional standby power source. For one- and two- family dwelling units, a sign shall be placed at the first responder disconnect required in 230.85 that indicates the type and location of each on-site optional standby power source. A sign shall not be required for individual unit equipment for standby illumination.

#### (B) Grounding.

Where removal of a grounding or bonding connection in normal power source equipment interrupts the grounding electrode conductor connection to the alternate power source(s) grounded conductor, a warning sign shall be installed at the normal power source equipment stating:

WARNING SHOCK HAZARD EXISTS IF GROUNDING ELECTRODE CONDUCTOR OR BONDING JUMPER CONNECTION IN THIS EQUIPMENT IS REMOVED WHILE ALTERNATE SOURCE(S) IS ENERGIZED.

The warning sign(s) or label(s) shall comply with 110.21(B).

#### (C) Power Inlet.

Where a power inlet is used for a temporary connection to a portable generator, a warning sign shall be placed near the inlet to indicate the type of derived system that the system is capable of based on the wiring of the transfer equipment. The sign shall display one of the following warnings:

WARNING: FOR CONNECTION OF A SEPARATELY DERIVED (BONDED NEUTRAL) SYSTEM ONLY or  
WARNING: FOR CONNECTION OF A NONSEPARATELY DERIVED (FLOATING NEUTRAL) SYSTEM ONLY

## Statement of Problem and Substantiation for Public Comment

FR 8462 has new requirements for shutdowns that allow first responders to remove the normal power source from one- and two-family dwelling units. Where conditions 230.85(2) or (3) would be present, the service disconnecting means and label required by 702.7(A) would be located elsewhere on or within the premises on one- and two-family dwelling units. For safety purposes the label required in 702.7(A) should be located at the first responder disconnecting means on one- and two-family dwellings units so that the first responders are aware that there are alternate sources of power so that all sources of power can be safely shut down.

For commercial and industrial installations, the label required in 702.7(A) should remain at the service-entrance equipment.

## Related Public Comments for This Document

| <u>Related Comment</u>                                                      | <u>Relationship</u> |
|-----------------------------------------------------------------------------|---------------------|
| <a href="#">Public Comment No. 42-NFPA 70-2018 [Section No. 705.10]</a>     |                     |
| <a href="#">Public Comment No. 1027-NFPA 70-2018 [Section No. 706.15]</a>   |                     |
| <a href="#">Public Comment No. 1112-NFPA 70-2018 [Section No. 480.7(A)]</a> |                     |

### Related Item

- PI 250 NFPA 70- 2017 and FR 7846 NFPA 70-2018

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**Submission Date:** Wed Jun 27 10:48:46 EDT 2018  
**Committee:** NEC-P13

## Committee Statement

**Committee Action:** Rejected but see related SR

**Resolution:** [SR-7632-NFPA 70-2018](#)

**Statement:** This second revision is necessary to correlate with new section 230.85. This requirement correlates the location of labels for emergency disconnects.



## Public Comment No. 1081-NFPA 70-2018 [ Section No. 706.1 ]

### 706.1 Scope.

This article applies to all energy storage systems (ESS) having a capacity greater than 3.6 MJ (1 kWh) that may be stand-alone or interactive with other electric power production sources. These systems are primarily intended to store and provide energy during normal operating conditions.

#### Informational Note

No. 1

:

For batteries rated in ampere hours, kWh is equal to the nominal rated voltage times ampere-hour rating divided by 1000. Informational Note No. 2:-

The following standards are frequently referenced for the installation of energy storage systems:

- (1) NFPA 111-2016, *Standard on Stored Electrical Energy Emergency and Standby Systems*
- (2) NFPA 855, *Standard for the Installation of Stationary Energy Storage Systems*
- (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) NECA 416, *Recommended Practice for Installing Energy Storage Systems (ESS)*
- (10) UL 810A, *Electrochemical Capacitors*
- (11) UL 1973, *Batteries for Use in Stationary, Vehicle Auxiliary Power, and Light Electric Rail (LER) Applications*
- (12) UL 1989, *Standard for Standby Batteries*
- (13) UL 9540, *Standard for Safety Energy Storage Systems and Equipment*
- (14) UL Subject 1974, *Standard for Evaluation of Repurposed Batteries*
- (15) UL Subject 2436, *Spill Containment For Stationary Lead Acid Battery Systems*

### Statement of Problem and Substantiation for Public Comment

It's not the purpose of the NEC to teach simple electrical relationships. If a user does not know this then they are not qualified to use the NEC.

#### Related Item

• First Revision No. 8103-NFPA 70-2018 • Public Input No. 2751-NFPA 70-2017 • Public Input No. 2852-NFPA 70-2017

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**Committee:** NEC-P13

### Committee Statement

**Committee Action:** Rejected  
**Resolution:** The Informational Note contains useful knowledge. As battery technology evolves it is helpful to have this information to correlate amp-hours with kwh.



## Public Comment No. 1645-NFPA 70-2018 [ Section No. 706.1 ]

### 706.1 Scope.

This article applies to all energy storage systems (ESS) having a capacity greater than 3.6 MJ (1 kWh) that may be stand-alone or interactive with other electric power production sources. These systems are primarily intended to store and provide energy during normal operating conditions. Storage batteries not associated with an ESS shall meet the provisions of Article 480.

Informational Note No. 1: For batteries rated in ampere hours, kWh is equal to the nominal rated voltage times ampere-hour rating divided by 1000.

Informational Note No. 2: There can be a subtle distinction between a battery storing energy and an energy storage system. The former are not necessarily an ESS and should comply with Article 480 and an ESS can be comprised of the former but as an ESS should comply with Article 706.

Informational Note No. 3: The following standards are frequently referenced for the installation of energy storage systems:

- (1) NFPA 111-2016, *Standard on Stored Electrical Energy Emergency and Standby Systems*
- (2) NFPA 855, *Standard for the Installation of Stationary Energy Storage Systems*
- (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 2018, *Guide for the Ventilation and Thermal Management of Batteries for Stationary Applications*
- (9) NECA 416, *Recommended Practice for Installing Energy Storage Systems (ESS)*
- (10) UL 810A, *Electrochemical Capacitors*
- (11) UL 1973, *Batteries for Use in Stationary, Vehicle Auxiliary Power, and Light Electric Rail (LER) Applications*
- (12) UL 1989, *Standard for Standby Batteries*
- (13) UL 9540, *Standard for Safety Energy Storage Systems and Equipment*
- (14) UL Subject 1974, *Standard for Evaluation of Repurposed Batteries*
- (15) UL Subject 2436, *Spill Containment For Stationary Lead Acid Battery Systems*

### Statement of Problem and Substantiation for Public Comment

There is currently no reference or pointer back to Article 480 on battery systems. As there can be confusion between a battery system and an ESS it is suggested that Article 480 be referenced just to make sure users that find themselves in Article 706 are clear as to what 706 covers (ESS as defined in 706.2) and if they are not covered there they know to go to Article 480.

#### Related Item

- 8103-NFPA 70-2018

### Submitter Information Verification

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**Committee:** NEC-P13

### Committee Statement

**Committee Action:** Rejected but see related SR

**Resolution:** [SR-7683-NFPA 70-2018](#)

**Statement:** Duplicate references to electrochemical standards that are already stated in Article 480 are deleted. Informational Note No. 2 list item (14) UL Subject 1974, Standard for Evaluation of Repurposed Batteries is deleted and moved to the Informational Note in 480.1. Note: Item (13) is not new and should not have been underlined.

ESS classifications that are in the 2017 NEC are no longer used in the ESS “industry.” Energy storage systems are simply energy storage systems. UL 9540, the Standard for Energy Storage Systems and Equipment does not specify or define any specific system classification terminology.

The title for UL 1973 has been updated.



## Public Comment No. 1794-NFPA 70-2018 [ Section No. 706.1 ]

### 706.1 Scope.

This article applies to all energy storage systems (ESS) having a capacity greater than 3.6 MJ (1 kWh) that may be stand-alone or interactive with other electric power production sources. These systems are primarily intended to store and provide energy during normal operating conditions.

Informational Note No. 1: For batteries rated in ampere hours, kWh is equal to the nominal rated voltage times ampere-hour rating divided by 1000.

Informational Note No. 2: The following standards are frequently referenced for the installation of energy storage systems:

- (1) NFPA 111-2016, *Standard on Stored Electrical Energy Emergency and Standby Systems*
- (2) NFPA 855, *Standard for the Installation of Stationary Energy Storage Systems*
- (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) NECA 416, *Recommended Practice for Installing Energy Storage Systems (ESS)*
- (10) UL 810A, *Electrochemical Capacitors*
- (11) UL 1973, *Batteries for Use in Stationary, Vehicle Auxiliary Power, and Light Electric Rail (LER) Applications*
- (12) ~~UL 1989, *Standard for Standby Batteries*~~
- (13) ~~UL 9540, *Standard for Safety Energy Storage Systems and Equipment*~~
- (14) UL Subject 1974, *Standard for Evaluation of Repurposed Batteries*
- (15) ~~UL Subject 2436, *Spill Containment For Stationary Lead-Acid Battery Systems*~~

### Statement of Problem and Substantiation for Public Comment

These editorial changes to this list are intended to remove duplicate references to electrochemical standards that are already in 480.

#### Related Item

- FR-8103

### Submitter Information Verification

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**Committee:** NEC-P13

## Committee Statement

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7683-NFPA 70-2018

**Statement:** Duplicate references to electrochemical standards that are already stated in Article 480 are deleted. Informational Note No. 2 list item (14) UL Subject 1974, Standard for Evaluation of Repurposed Batteries is deleted and moved to the Informational Note in 480.1. Note: Item (13) is not new and should not have been underlined.

ESS classifications that are in the 2017 NEC are no longer used in the ESS "industry." Energy storage systems are simply energy storage systems. UL 9540, the Standard for Energy Storage Systems and Equipment does not specify or define any specific system classification terminology.

The title for UL 1973 has been updated.

**Public Comment No. 1795-NFPA 70-2018 [ 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 or converter, or alarm systems are assembled, installed, and packaged into a singular energy storage container or unit.

Informational Note: Self-contained systems, are 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 Comment**

Editorial change adding "are".

**Related Item**

- FR-8105

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**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected

**Resolution:** See SR 7560 which deletes these definitions.



## Public Comment No. 1634-NFPA 70-2018 [ Definitions (706.2): Energy Stor... to Energy Stor... ]

### Definitions (706.2): Energy Stor... to Energy Stor...

#### 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 or converter, or alarm systems are assembled, installed, and packaged into a singular energy storage container or unit.

Informational Note: Self-contained systems, 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.

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 intended to be assembled as an energy storage system at the system installation site.

Informational Note: Pre-engineered systems 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 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 Comment

These terms are not used in NFPA 855 nor are they relevant with respect to testing and listing of ESS and their installation. As per other public comments to address this issue these terms would not be used in 706 and would not need to be defined. Simply put an ESS is an ESS and no longer needs to be classified according to these three terms.

### Related Public Comments for This Document

| <u>Related Comment</u>                                                   | <u>Relationship</u> |
|--------------------------------------------------------------------------|---------------------|
| <a href="#">Public Comment No. 1431-NFPA 70-2018 [Section No. 706.4]</a> |                     |
| <a href="#">Public Comment No. 1599-NFPA 70-2018 [Section No. 706.9]</a> |                     |
| <a href="#">Public Comment No. 1587-NFPA 70-2018 [Section No. 706.7]</a> |                     |
| <a href="#">Public Comment No. 1572-NFPA 70-2018 [Section No. 706.5]</a> |                     |

#### Related Item

- 8922-NFPA 70-2018

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**Submission Date:** Wed Aug 29 13:54:52 EDT 2018  
**Committee:** NEC-P13

### Committee Statement

**Committee Action:** Rejected but see related SR  
**Resolution:** [SR-7560-NFPA 70-2018](#)  
**Statement:** These terms have been deleted as they are not used in Article 706.



## Public Comment No. 1431-NFPA 70-2018 [ Section No. 706.4 ]

### 706.4 System Classification and Marking Requirements.

#### ~~(A) Classification.~~

~~ESS shall be classified as one of the types described as follows:~~

- ~~(1) ESS, self-contained~~
- ~~(2) ESS, pre-engineered~~
- ~~(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) Available fault current derived by the ESS at the output terminals~~
- ~~(7) Utility-interactive capability, if applicable~~

## Statement of Problem and Substantiation for Public Comment

During the development of NFPA 855 the ESS classifications that are in the NEC were initially used but are no longer used in 855, nor are they used in the ESS 'industry'. Energy storage systems are simply energy storage systems, there is now a standard for testing and listing such systems (UL 9540), which NFPA 855 references and is widely used to validate the safety of ESS (without any specific system classification terminology as that in the NEC). As such the system classification requirements in 706.4 impose a classification requirement that is inconsistent with the standard such systems are being tested and listed to and is inconsistent with NFPA 855. This will create confusion and inconsistency within the NFPA standards and other standards referenced in NFPA standards.

## Related Public Comments for This Document

| <u>Related Comment</u>                                                                       | <u>Relationship</u> |
|----------------------------------------------------------------------------------------------|---------------------|
| Public Comment No. 1599-NFPA 70-2018 [Section No. 706.9]                                     |                     |
| Public Comment No. 1623-NFPA 70-2018 [Section No. 706.20]                                    |                     |
| Public Comment No. 1634-NFPA 70-2018 [Definitions (706.2): Energy Stor... to Energy Stor...] |                     |

#### Related Item

- 8922-NFPA 70-2018

## Submitter Information Verification

**Submitter Full Name:** David Conover  
**Organization:** Pacific Northwest National Lab  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Tue Aug 28 13:54:51 EDT 2018  
**Committee:** NEC-P13

## Committee Statement

**Committee** Rejected but see related SR

**Action:**

**Resolution:** [SR-7684-NFPA 70-2018](#)

**Statement:** ESS classifications that are in the 2017 NEC are no longer used in the ESS "industry." Energy storage systems are simply energy storage systems. UL 9540, the Standard for Energy Storage Systems and Equipment does not specify or define any specific system classification terminology.

The list items in 706.4 were revised for clarity and to align with the marking requirements in UL 9540, the Standard for Energy Storage Systems. "Available fault current" is a required marking in UL 9540.

**Public Comment No. 1796-NFPA 70-2018 [ Section No. 706.4(B) ]****(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) ~~Available fault current derived by~~ Maximum output and input current of the ESS at the output terminals
- (7) Utility-interactive capability, if applicable

**Statement of Problem and Substantiation for Public Comment**

This requested change aligns this section's marking requirements with the UL 9540 marking requirements.

**Related Item**

- FR-8922

**Submitter Information Verification**

**Submitter Full Name:** Jason Fisher

**Organization:** Tesla Inc.

**Affiliation:** Solar Energy Industries Association (SEIA)

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Thu Aug 30 08:24:07 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7684-NFPA 70-2018

**Statement:** ESS classifications that are in the 2017 NEC are no longer used in the ESS "industry." Energy storage systems are simply energy storage systems. UL 9540, the Standard for Energy Storage Systems and Equipment does not specify or define any specific system classification terminology.

The list items in 706.4 were revised for clarity and to align with the marking requirements in UL 9540, the Standard for Energy Storage Systems. "Available fault current" is a required marking in UL 9540.



## Public Comment No. 1909-NFPA 70-2018 [ Section No. 706.4(B) ]

### (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 ESS ac voltage and amperes  
~~Available fault current derived by~~
- (6) maximum ESS dc voltage
- (7) Maximum output and input current of the ESS at the output terminals
- (8) Utility-interactive capability, if applicable

### Statement of Problem and Substantiation for Public Comment

The proposed change would better align the marking requirement with the markings provided by UL 9540, and prevent potential conflict between the markings required by 706.4 and 706.15.

Note: Terraview appears to insert a carriage return mid-line, the proposed language for item 5) should be "Nominal ESS ac voltage and maximum ESS dc voltage" as one line.

### Related Public Comments for This Document

| <u>Related Comment</u>                                       | <u>Relationship</u> |
|--------------------------------------------------------------|---------------------|
| Public Comment No. 1986-NFPA 70-2018 [Section No. 706.15(C)] |                     |
| Public Comment No. 1986-NFPA 70-2018 [Section No. 706.15(C)] |                     |
| <u>Related Item</u>                                          |                     |
| • 8922                                                       |                     |

### Submitter Information Verification

**Submitter Full Name:** Phil Undercuffler  
**Organization:** Outback Power Technologies  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Thu Aug 30 12:02:28 EDT 2018  
**Committee:** NEC-P13

### Committee Statement

**Committee Action:** Rejected but see related SR  
**Resolution:** SR-7684-NFPA 70-2018  
**Statement:** ESS classifications that are in the 2017 NEC are no longer used in the ESS "industry." Energy storage systems are simply energy storage systems. UL 9540, the Standard for Energy Storage Systems and Equipment does not specify or define any specific system classification terminology.

The list items in 706.4 were revised for clarity and to align with the marking requirements in UL 9540, the Standard for Energy Storage Systems. "Available fault current" is a required marking in UL 9540.

**Public Comment No. 1572-NFPA 70-2018 [ Section No. 706.5 ]****706.5** Listing.

Equipment shall meet the requirements of 706.5(A) or (B).

~~(A) ESS, Other.~~

~~Monitors, controls, switches, fuses, circuit breakers, power conversion systems, inverters and transformers, energy storage devices, battery management systems, and other components of the ESS other than lead-acid batteries,~~

Energy storage systems shall be listed.

~~(B) ESS, Self-Contained, and ESS, Pre-engineered.~~

~~Self-contained ESS and pre-engineered ESS shall be listed.~~

**Statement of Problem and Substantiation for Public Comment**

There is currently a published standard that is being used as a basis for testing and listing energy storage systems (UL 9540). This is recognized already in the committee statement to First Revision No. 8103-NFPA 70-2018 and the text shown in 706.1. This is also consistent with NFPA 855, Section 4.2.1, wherein ESS are required to be listed to UL 9540. UL 9540 currently forms a uniform basis for documenting and validating the safety of an ESS, and through reference to applicable component standards, the components of an ESS. It is recognized that the style manual used for the NEC does not provide for direct reference to such standards (e.g. those for listing), hence UL 9540 is not specifically referenced in the proposed revision. That said the requirement for ESS to be listed provides a de facto path to this UL standard. It is noted that in NFPA 855 that battery systems are also covered and exceptions exist for their approval beyond testing and listing to UL 9540. In that the NEC addresses battery systems in Article 480, listings and relevant test standards for battery systems would be covered there. Consequently Article 706 can and should appropriately reference a standard to cover the listing of a complete ESS because it covers ESS, as does NFPA 855; creating consistency within NFPA documents applicable to ESS. If a reference to UL 9540 were permitted a committee comment to add "in accordance with UL 9540" to the end of the proposed text in this public comment would be appropriate.

**Related Public Comments for This Document**

| <b><u>Related Comment</u></b>                                                                                | <b><u>Relationship</u></b> |
|--------------------------------------------------------------------------------------------------------------|----------------------------|
| <a href="#">Public Comment No. 1599-NFPA 70-2018 [Section No. 706.9]</a>                                     |                            |
| <a href="#">Public Comment No. 1623-NFPA 70-2018 [Section No. 706.20]</a>                                    |                            |
| <a href="#">Public Comment No. 1634-NFPA 70-2018 [Definitions (706.2): Energy Stor... to Energy Stor...]</a> |                            |

**Related Item**

• 8923-NFPA 70-2018 • 8103-NFPA 70-2018

**Submitter Information Verification**

**Submitter Full Name:** David Conover  
**Organization:** Pacific Northwest National Lab  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Wed Aug 29 12:07:03 EDT 2018  
**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Accepted  
**Resolution:** [SR-7686-NFPA 70-2018](#)  
**Statement:** ESS classifications that are in the 2017 NEC are no longer used in the ESS "industry." Energy storage systems are simply energy storage systems and should be listed.

**Public Comment No. 1090-NFPA 70-2018 [ Section No. 706.7 ]****706.7 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. 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-2016 *Recommended Practice for Electrical Equipment Maintenance* or ANSI/NETA ATS-2017, *Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems*.

**Statement of Problem and Substantiation for Public Comment**

The NEC does not specify maintenance requirements like this text does except for critical systems such as Emergency Systems (Art. 700), Legally Required Standby Systems (Art. 701), and Critical Operations Power Systems (Art 708). These are systems that need to be operational above and beyond the needs of standard systems covered under other articles in the NEC. Many systems covered by the NEC require periodic maintenance to provide safe operation but that requirement is also not called out. The NEC does not call out maintenance requirements in Art. 480 for batteries.

There is no reason that I can come up with considering the NEC as a whole why ESS in 706 should be singled out from other non-critical systems as requiring maintenance and requiring that maintenance logs be maintained. Let's not add unnecessary requirements.

**Related Item**

- First Revision No. 8924-NFPA 70-2018

**Submitter Information Verification**

**Submitter Full Name:** MARVIN HAMON

**Organization:** HAMON ENGINEERING INC

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Wed Aug 22 16:10:46 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected

**Resolution:** Maintenance requirements are necessary to ensure safe operation of energy storage systems.

**Public Comment No. 1587-NFPA 70-2018 [ Section No. 706.7 ]****706.7** 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. 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. accordance with NFPA 855.~~

Informational Note: For information related to general electrical equipment maintenance and developing an effective electrical preventive maintenance (EPM) program, see NFPA 70B-2016 *Recommended Practice for Electrical Equipment Maintenance* or ANSI/NETA ATS-2017, *Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems*.

**Statement of Problem and Substantiation for Public Comment**

Chapter 7 of NFPA 855 provides a uniform set of requirements for ESS operation and maintenance. These provisions reference the ESS manufacturer's instructions, provide for documentation related to O&M being available, posting of hazardous materials SDS, availability of maintenance records and a number of other safety-relevant topics appropriately addressed during O&M. These provisions, while in line with those in 706.7 of the NEC, are more robust and better address the committee statement for the inclusion of 706.7 in the NEC. NFPA 855 is already referenced in the first revision report (see 8979 and 8103) and a reference to 855 is appropriate in 706.7 as well. If that is not acceptable then consideration should be given to development of a committee comment that would replace the wording in 706.7 with that in Chapter 7 of 855. Clearly having two NFPA standards (70 and 855) covering the same topic with different and potentially conflicting provisions will create challenges that could be avoided if deference to the NFPA standard covering ESS installations (855) were created in Article 706 of the NEC.

**Related Public Comments for This Document**

| <u>Related Comment</u>                                                                       | <u>Relationship</u> |
|----------------------------------------------------------------------------------------------|---------------------|
| Public Comment No. 1623-NFPA 70-2018 [Section No. 706.20]                                    |                     |
| Public Comment No. 1634-NFPA 70-2018 [Definitions (706.2): Energy Stor... to Energy Stor...] |                     |
| <u>Related Item</u>                                                                          |                     |
| • 8924-NFPA 70-2018                                                                          |                     |

**Submitter Information Verification**

**Submitter Full Name:** David Conover  
**Organization:** Pacific Northwest National Lab  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Wed Aug 29 12:33:55 EDT 2018  
**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected  
**Resolution:** Mandatory references to other standards are prohibited by the NEC Manual of Style. Also, NFPA 855 is still in the draft stage and is not yet published.



## Public Comment No. 1599-NFPA 70-2018 [ Section No. 706.9 ]

### 706.9 Maximum Voltage.

#### (A) ~~ESS, Self-Contained and ESS, Pre-engineered~~ Listed ESS .

The maximum voltage of ~~self-contained or pre-engineered systems intended for field assembly as a system~~ an ESS shall be the rated ESS input and output voltage(s) indicated on the ESS nameplate(s) or system listing.

#### (B) Unlisted ESS, ~~Other~~ .

The maximum voltage for each circuit shall be in accordance with one of the following:

- (1) For dc circuits, the voltage shall be calculated based on the highest charging voltage, including any temperature compensation and equalization.
- (2) For ac circuits, the voltage shall be the nominal ac voltage.
- (3) For circuits connected to two or more series-connected dc-to-dc converters, the 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 voltage shall be the sum of the maximum rated voltage output of all the dc-to-dc converters connected in series.
- (4) For circuits connected to the output of a single dc-to-dc converter, the voltage shall be the rated maximum voltage output of the dc-to-dc converter.

## Statement of Problem and Substantiation for Public Comment

The classification of ESS is no longer applied and its retention will cause confusion amongst those documenting and validating compliance with NFPA 70 and 855. ESS are simply listed (most likely to UL 9540, which is currently listed in Article 706), which will cover the issue of maximum voltage. The provisions of 706.9 (B) are suggested to be retained because under the equivalency provisions in NFPA 70 that would allow for alternative methods and as such unlisted ESS may be proposed for installation.

## Related Public Comments for This Document

| <u>Related Comment</u>                                                                                       | <u>Relationship</u> |
|--------------------------------------------------------------------------------------------------------------|---------------------|
| <a href="#">Public Comment No. 1431-NFPA 70-2018 [Section No. 706.4]</a>                                     |                     |
| <a href="#">Public Comment No. 1572-NFPA 70-2018 [Section No. 706.5]</a>                                     |                     |
| <a href="#">Public Comment No. 1623-NFPA 70-2018 [Section No. 706.20]</a>                                    |                     |
| <a href="#">Public Comment No. 1634-NFPA 70-2018 [Definitions (706.2): Energy Stor... to Energy Stor...]</a> |                     |

### Related Item

- 8925-NFPA 70-2018

## Submitter Information Verification

**Submitter Full Name:** David Conover  
**Organization:** Pacific Northwest National Lab  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Wed Aug 29 12:58:28 EDT 2018  
**Committee:** NEC-P13

## Committee Statement

**Committee Action:** Rejected but see related SR  
**Resolution:** [SR-7687-NFPA 70-2018](#)  
**Statement:** ESS classifications that are in the 2017 NEC are no longer used in the ESS "industry." Energy storage systems are simply energy storage systems. UL 9540, the Standard for Energy Storage Systems and Equipment does not specify or define any specific system classification terminology.





## Public Comment No. 1027-NFPA 70-2018 [ Section No. 706.15 ]

### 706.15 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 shall be lockable open in accordance with 110.25.

The disconnecting means is permitted to be integral to listed ESS equipment.

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.

A sign shall be placed at the service-entrance equipment for commercial and industrial installations that indicates the location of each energy storage system disconnecting means. For one- and two- family dwelling units, a sign shall be placed at the first responder disconnect required in 230.85 that indicates the location of each energy storage system disconnecting means.

#### (B) Remote Actuation.

Where controls to activate the disconnecting means of an ESS are used and are not located within sight of the system, the location of the controls shall be field marked on the disconnecting means.

#### (C) 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 to indicate the following:

- (1) Nominal ESS ac voltage and maximum ESS dc voltage
- (2) Available fault 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-2018, Standard for Electrical Safety in the Workplace*. This standard provides specific criteria for developing arc-flash labels for equipment that provides nominal system voltage, incident energy levels, arc-flash boundaries, minimum required levels of personal protective equipment, and so forth.

Informational Note No. 2: Battery equipment suppliers can provide information about available fault 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

The notification(s) and marking(s) shall comply with 110.21(B).

#### (D) Partitions Between Components.

Where circuits from the input or output terminals of energy storage components in an ESS pass through a wall, floor, or ceiling, a readily accessible disconnecting means shall be provided within sight of the energy storage component. Fused disconnecting means or circuit breakers shall be permitted to be used.

## Statement of Problem and Substantiation for Public Comment

The additional language for signage is required for correlation with other articles of the code that require other power sources to be identified at the service equipment. For safety purposes when each power source needs to be removed from a premise wiring system, the location of every disconnect should be available to first responders.

## Related Public Comments for This Document

### Related Comment

[Public Comment No. 41-NFPA 70-2018 \[Section No. 702.7\]](#)

### Relationship

signage requirements

[Public Comment No. 1112-NFPA 70-2018 \[Section No. 480.7\(A\)\]](#)

**Related Item**

- FR 7846 NFPA 70-2018

**Submitter Information Verification**

**Submitter Full Name:** Brian Baughman

**Organization:** Generac Power Systems Inc

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Wed Aug 22 08:03:07 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected

**Resolution:** The intent of the submitter is met in the present text of 705.10, which requires a permanent plaque or directory at the service entrance location.



## Public Comment No. 1942-NFPA 70-2018 [ Section No. 706.15 ]

### 706.15 ESS Source 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 shall be lockable open in accordance with 110.25.

The disconnecting means is permitted to be integral to listed ESS equipment.

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.

#### (B) Remote Actuation.

Where controls to activate the disconnecting means of an ESS are used and are not located within sight of the system, the location of the controls shall be field marked on the disconnecting means.

#### (C) 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 to indicate the following:

- (1) Nominal ESS ac voltage and maximum ESS dc voltage
- (2) Available fault 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-2018, Standard for Electrical Safety in the Workplace*. This standard provides specific criteria for developing arc-flash labels for equipment that provides nominal system voltage, incident energy levels, arc-flash boundaries, minimum required levels of personal protective equipment, and so forth.

Informational Note No. 2: Battery equipment suppliers can provide information about available fault 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

The notification(s) and marking(s) shall comply with 110.21(B).

#### (D) Partitions Between Components.

Where circuits from the input or output terminals of energy storage components in an ESS pass through a wall, floor, or ceiling, a readily accessible disconnecting means shall be provided within sight of the energy storage component. Fused disconnecting means or circuit breakers shall be permitted to be used.

## Statement of Problem and Substantiation for Public Comment

The three repeating uses of Disconnecting Means is confusing and is an opportunity to improve. Revising the title of Part II clarifies that these requirements are specific to sources, and adding "ESS Source" to the beginning of 706.15 clarifies that the requirements of 706.15 (disconnection, remote actuation, notification & marking, and partitions) apply to the ESS source output.

## Related Public Comments for This Document

| <u>Related Comment</u>                                          | <u>Relationship</u> |
|-----------------------------------------------------------------|---------------------|
| <a href="#">Public Comment No. 1917-NFPA 70-2018 [Part II.]</a> |                     |
| <a href="#">Public Comment No. 1917-NFPA 70-2018 [Part II.]</a> |                     |

### Related Item

- FR-8942

### Submitter Information Verification

**Submitter Full Name:** Phil Undercuffler

**Organization:** Outback Power Technologies

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Thu Aug 30 12:50:03 EDT 2018

**Committee:** NEC-P13

### Committee Statement

**Committee Action:** Rejected

**Resolution:** The addition to the title of "ESS Source" adds confusion. It is not clear what is a source for the ESS. The revised title could infer this section covers requirements for a disconnect at the input to the ESS, clearly that is not what is covered by 706.15.

**Public Comment No. 1544-NFPA 70-2018 [ Section No. 706.15(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. The disconnecting means shall be lockable open in accordance with 110.25.

The disconnecting means is permitted to be integral to listed ESS equipment.

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 and grouped with the Emergency Disconnects required in 230.85.

**Statement of Problem and Substantiation for Public Comment**

This Public Comment is being submitted by a Correlating Committee Task Group that was created as a result of Correlating Committee Note No. 65. Members of the Task Group included Larry Ayer (Co-Chair), James Dollard, David Hittinger, Vince Saporita (Co-Chair), and David Williams. The Correlating Committee directed the Task Group to review the term "Emergency disconnect switches" and correlate it with the terminology used in FR-8642 (new Section 230.85), FR 7770 (Section 445.18(A)), and FR 8942 (Section 706.15).

The term "emergency disconnect switches" is changed to "emergency disconnects" in new 230.82(10) to correlate with the term in new 230.85.

The term "emergency disconnect(s)" is changed to "emergency disconnects", "switch(es)" is changed to "switches", and "breaker(s)" is changed to "breakers" in 230.85 to agree with the NEC Style Manual.

For FR 8874, the term "Emergency stop switch" is used correctly in title of 445.18 and therefore no changes are necessary.

For FR 7846 (Section 445.18(D)), the term "First Responder Shutdown" is changed to "Emergency Shutdown" for correlation with these other changes.

For FR 8942 (Section 706.15), the ESS disconnecting means, or its remote control, must be grouped with the emergency disconnects required in new 230.85, for the safety of first responders. Unless the ESS switch or its remote control is in close proximity when first responders try to de-energize the service of the dwelling unit by utilizing the outdoor emergency disconnects required by new 230.85, they will expect that the entire dwelling unit is totally de-energized. If the ESS switch, or its remote control, is not in close proximity, the first responders may not know that the dwelling unit is still energized. The revised requirement will help the first responders recognize that there is an additional disconnecting means that is necessary to totally de-energize the dwelling unit. The term "ESS disconnecting means" is used correctly in 706.15.

**Related Item**

- FR8942

**Submitter Information Verification**

**Submitter Full Name:** Vincent Saporita

**Organization:** Eaton's Bussmann Business

**Affiliation:** Eaton's Bussmann Business

**Street Address:**

**City:**

**State:**

**Zip:**

**Submission Date:** Wed Aug 29 11:18:48 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected

**Resolution:** The added requirement for grouping is overly restrictive. Requiring the disconnecting means or its remote control to be located at a readily accessible location outside the building is sufficient for first responders. Note: See PC 1275.

**Public Comment No. 1905-NFPA 70-2018 [ Section No. 706.15(A) ]****(A) ESS Disconnecting Means.**

A disconnecting means shall be provided for all ungrounded conductors derived from an ESS. A disconnecting means, or its means of remote control, shall be readily accessible and located within the equipment or within sight of the ESS. ~~The disconnecting means shall~~ Where not located within the equipment or within sight of the ESS, the disconnecting means or enclosure providing access to the disconnecting means shall be lockable open in accordance with 110.25.

~~The disconnecting means is permitted to be integral to listed ESS equipment.~~

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

**Statement of Problem and Substantiation for Public Comment**

Changes to the First Draft language are requested to help with the practical implementation of ESS disconnect rules. While large ESS systems are likely to utilize local disconnecting means consisting of traditional enclosed breakers or switches, applications of smaller ESS units will likely locate these devices some distance away, particularly for interactive systems. Furthermore remote shutdown devices will likely be used especially in applications of one and two-family dwellings. The changes requested in this language will ensure that these effective and practical solutions can still be utilized while also ensuring that persons working on the ESS equipment have a means to lockout the disconnecting means to maintain an electrically safe condition. Additionally a change to the text permitting the device to be integral is suggested in an effort to simplify how this section reads. These requested changes align with similar rules applied to PV systems in Article 690.

**Related Item**

- FR-8942

**Submitter Information Verification**

**Submitter Full Name:** Jason Fisher

**Organization:** Tesla Inc.

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Thu Aug 30 11:49:05 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7700-NFPA 70-2018

**Statement:** This revision clarifies the requirements for locating the ESS disconnecting means. Additional text is added to address installations where it is impractical to install the required disconnect within sight of the ESS.



## Public Comment No. 1986-NFPA 70-2018 [ Section No. 706.15(C) ]

### (C) 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 to indicate the following:

- (1) ~~Nominal ESS ac voltage and maximum ESS dc voltage~~
- (2) ~~Available fault 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-2018, Standard for Electrical Safety in the Workplace*. This standard provides specific criteria for developing arc-flash labels for equipment that provides nominal system voltage, incident energy levels, arc-flash boundaries, minimum required levels of personal protective equipment, and so forth.

Informational Note No. 2: Battery equipment suppliers can provide information about available fault 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

The notification(s) and marking(s) shall comply with 110.21(B).

### Statement of Problem and Substantiation for Public Comment

The marking requirements for voltage and fault current are already addressed in 706.4, creating multiple duplicate but not quite identical requirements creates unnecessary confusion and conflict.

### Related Public Comments for This Document

#### Related Comment

[Public Comment No. 1909-NFPA 70-2018 \[Section No. 706.4\(B\)\]](#)

[Public Comment No. 1909-NFPA 70-2018 \[Section No. 706.4\(B\)\]](#)

#### Relationship

#### Related Item

- FR-8942

### Submitter Information Verification

**Submitter Full Name:** Phil Undercuffler

**Organization:** Outback Power Technologies

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Thu Aug 30 13:46:00 EDT 2018

**Committee:** NEC-P13

### Committee Statement

**Committee Action:** Rejected

**Resolution:**

These requirements are not duplicates. Section 706.4 covers the entire ESS, 706.15 covers the disconnecting means.

**Public Comment No. 1611-NFPA 70-2018 [ Section No. 706.16 ]****706.16** ~~Connection to Other~~ to Energy Sources.

The connection of an ESS ~~to other sources~~ to sources of energy shall comply with 706.16(A) through (F).

**(A)** Source Disconnect.

A disconnect that has multiple sources of power shall disconnect all energy sources when in the off position.

**(B)** Identified Interactive Equipment.

ESS that operate in parallel with other ac electrical sources shall use inverters that are listed and identified as interactive.

**(C)** Loss of Interactive System Power.

Upon loss of a primary source of power, an ESS with a utility-interactive inverter shall comply with the requirements of 705.40.

**(D)** Unbalanced Interconnections.

Unbalanced ac connections between an ESS and other ac electric power production sources shall be in accordance with 705.100.

**(E)** Connection to Other Energy Sources.

The connection of an ESS to other energy sources shall be in accordance with 705.12 and Parts III and VI of Article 712.

**(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 Comment**

A reading of the revisions to 706.16 in First Revision No. 8943 suggests that while the current wording is 'energy sources' a change to simply 'sources' may lead to more confusion (e.g. what type of sources?). In reading the provisions of this section it seems clear the intent is power or electrical sources. Then in (E) the title causes further confusion by using 'other' energy sources – which begs the issue 'other' is those covered in (A) to (D) but in reading those it is not clear what sources are covered. The proposed changes are intended to provide clarification as to what each subsection in 706.16 applies to. If the proposed changes are in further need of enhancement because they do not fully clarify the current text a committee comment based on this public comment should be considered. Either way the current text is confusing as noted above.

**Related Item**

- 8943-NFPA 70-2018

**Submitter Information Verification**

**Submitter Full Name:** David Conover

**Organization:** Pacific Northwest National Lab

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Wed Aug 29 13:15:19 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7693-NFPA 70-2018

**Statement:** The changes clarify that 706.16 applies to "Energy Sources" and provide an explanation as to what each subsection in 706.16 applies to.

The term "electrical" was deleted in (B) as it is redundant to ac.

The title of (E) was modified for clarity and better coordination with the title of the section.



## Public Comment No. 1623-NFPA 70-2018 [ Section No. 706.20 ]

### 706.20 General.

#### (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 Ventilation of ESS shall be permitted to provide ventilation in accordance with the manufacturer's recommendations and listing for the system NFPA 855.~~

Informational Note No. 1: See NFPA 1-2018, *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 2018 /ASHRAE Guideline 21-2012 2018, *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 1-2018, *Fire Code*.

#### (B) 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, a maximum ESS voltage of 600 volts dc shall be permitted.*

#### (C) Spaces About ESS Components.

##### (1) General.

Working spaces for ESS shall comply with 110.26 and 110.34.

##### (2) ~~Pre-engineered and Self-Contained Listed~~ ESS.

Listed ~~pre-engineered and self-contained~~ ESSs shall be permitted to have space between components in accordance with the manufacturer's instructions and listing.

Informational Note: Additional space may be needed to accommodate ESS hoisting equipment, tray removal, or spill containment.

##### (3) Other ESS.

Requirements for spaces around batteries that are components of electrochemical ESSs are provided in 480.10(C).

## Statement of Problem and Substantiation for Public Comment

NFPA 855 provides more robust and detailed provisions for ventilation and exhaust of ESS and should be referenced. If, as with other public comments, that is not possible the text on this topic that is in NFPA 855 could be used as a basis for a committee comment to improve the provisions in 706.20. It is noted that IEEE 1635/ASHRAE 21 was recently updated and published as a 2018 edition. The provisions covering pre-engineered and self-contained ESS are revised to simply refer to listed ESS as per other public comments related to ESS classifications being unnecessary.

## Related Public Comments for This Document

| <u>Related Comment</u>                                                   | <u>Relationship</u> |
|--------------------------------------------------------------------------|---------------------|
| <a href="#">Public Comment No. 1431-NFPA 70-2018 [Section No. 706.4]</a> |                     |
| <a href="#">Public Comment No. 1572-NFPA 70-2018 [Section No. 706.5]</a> |                     |
| <a href="#">Public Comment No. 1587-NFPA 70-2018 [Section No. 706.7]</a> |                     |
| <a href="#">Public Comment No. 1599-NFPA 70-2018 [Section No. 706.9]</a> |                     |

#### Related Item

- 8944-NFPA 70-2018

## Submitter Information Verification

**Submitter Full Name:** David Conover  
**Organization:** Pacific Northwest National Lab  
**Street Address:**

**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Wed Aug 29 13:27:56 EDT 2018  
**Committee:** NEC-P13

### Committee Statement

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7698-NFPA 70-2018

**Statement:** ESS classifications that are in the 2017 NEC are no longer used in the ESS "industry." Energy storage systems are simply energy storage systems. UL 9540, the Standard for Energy Storage Systems and Equipment does not specify or define any specific system classification terminology. Replacing requirements with a reference to NFPA 855 is not permissible as this standard has not been published, and violates the NEC Style Manual.

"Dwelling units" is too broad of a category for this requirement since large buildings such as multi-family units, or dorms could be served by much larger ESS units that may be permitted to have higher dc voltages Note: Reference to FR 8961 is incorrect, it should be to FR 8944.

References were also updated.

**Public Comment No. 1798-NFPA 70-2018 [ Section No. 706.20(B) ]****(B) Dwelling Units.**

An ESS for one- and two-family dwelling units shall not exceed 100 volts dc between conductors or to ground.

*Exception: Where live parts are not accessible during routine ESS maintenance, a maximum ESS voltage of 600 volts dc shall be permitted.*

**Statement of Problem and Substantiation for Public Comment**

"Dwelling units" is too large of a category for this requirement since large buildings such as multi-family units, or dorms could be served by much larger ESS units that would be allowed to have higher dc voltages if meeting other NEC and building and fire Code requirements. A restriction to one and two-family dwelling units is appropriate. Note that other Codes and Standards, including the new (draft) NFPA-855, as well as Fire Codes, restrict the location and access of ESS.

**Related Item**

- FR-8961

**Submitter Information Verification**

**Submitter Full Name:** Jason Fisher

**Organization:** Tesla Inc.

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Thu Aug 30 08:38:44 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7698-NFPA 70-2018

**Statement:** ESS classifications that are in the 2017 NEC are no longer used in the ESS "industry." Energy storage systems are simply energy storage systems. UL 9540, the Standard for Energy Storage Systems and Equipment does not specify or define any specific system classification terminology. Replacing requirements with a reference to NFPA 855 is not permissible as this standard has not been published, and violates the NEC Style Manual.

"Dwelling units" is too broad of a category for this requirement since large buildings such as multi-family units, or dorms could be served by much larger ESS units that may be permitted to have higher dc voltages Note: Reference to FR 8961 is incorrect, it should be to FR 8944.

References were also updated.

**Public Comment No. 1867-NFPA 70-2018 [ Section No. 706.21 ]****706.21– 17** Directory (Identification of Power Sources).

ESS shall be indicated by markings or labels that shall be in accordance with 110.21(B).

**(A)** Facilities with Utility Services and ESS.

Plaques or directories shall be installed in accordance with 705.10 and 712.10(A) .

*Exception: Multiple power production sources that are grouped shall be permitted to use a common designation on the directory.*

**(B)** Facilities with Stand-Alone Systems.

~~A permanent plaque. Plaques or directory directories shall be installed outside a building or structure supplied by a stand-alone system 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 premises or be grouped with other plaques or directories for other on-site sources.~~

~~Any structure or building with an ESS shall also have a permanent plaque or directory installed on the exterior of the building or structure at an approved readily visible location. The plaque or directory shall indicate the location of system disconnecting means.~~

*Exception: Multiple power production sources that are grouped shall be permitted to use a common designation on the directory.*

~~in accordance with 710.10.~~

**Statement of Problem and Substantiation for Public Comment**

Changes made to this section are part of a larger group of changes to other articles that are being recommended in an effort to harmonize all directory requirements for onsite sources. During the public input phase we submitted several inputs that were also being coordinated with changes being proposed to other fire and building codes. Our intention is to standardize and harmonize these requirements to address the situation where different onsite sources may be installed by different groups at different times. During the First Draft state we received significant input and support by both CMP-13 and CMP-4 to improve our inputs. This comment is related to several other comments that realign all the changes made in the First Draft to ensure all requirements remain harmonized across the different articles.

While the section 710.10 did not exist in the 2017 edition, CMP-4 has now included this section and all related requirements for plaques and directories for stand-alone systems in this section so it is no longer necessary to include these details in this section.

The exceptions are unnecessary here since they are now included in the referenced sections.

A move to Part II Disconnecting Means is recommended as these requirements are directly related to the requirements for ESS disconnects.

**Related Item**

• FR-8953 • FR-8721

**Submitter Information Verification**

**Submitter Full Name:** Jason Fisher

**Organization:** Tesla Inc.

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Thu Aug 30 10:44:23 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7703-NFPA 70-2018

**Statement:**

Requirements for plaques and directories in facilities with Stand-Alone Systems are deleted, but replaced with a reference to 710.10 where identical requirements are covered.

**Public Comment No. 428-NFPA 70-2018 [ Section No. 706.21(B) ]****(B) Facilities with Stand-Alone Systems.**

~~A permanent plaque or directory shall be installed outside a building or structure supplied by a stand-alone system 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 premises or be grouped with other plaques or directories for other on-site sources.~~

Any structure or building with an ESS shall also have a permanent plaque or directory installed on the exterior of the building or structure at an approved readily visible location. The plaque or directory shall indicate the location of system disconnecting means.

*Exception: Multiple power production sources that are grouped shall be permitted to use a common designation on the directory.*

**Statement of Problem and Substantiation for Public Comment**

This first paragraph was added in the First Revision and yet the FR says nothing about this addition. This section belongs in Article 710, not 706. Let's keep it there and not have this in multiple articles. If 706 is going to say anything about Stand-Alone systems, it should only be talking about ESS connected to an Article 710 system. This first paragraph should simply be deleted.

**Related Item**

- FR 8953

**Submitter Information Verification**

**Submitter Full Name:** William Brooks

**Organization:** Brooks Engineering

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Mon Aug 06 15:49:15 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7703-NFPA 70-2018

**Statement:** Requirements for plaques and directories in facilities with Stand-Alone Systems are deleted, but replaced with a reference to 710.10 where identical requirements are covered.

**Public Comment No. 1809-NFPA 70-2018 [ Section No. 706.31(F) ]****(F) Location.**

Where circuits from the input or output terminals of energy storage components in an ESS pass through a wall, floor, or ceiling, overcurrent protection shall be provided at the energy storage component end of the circuit.

**Statement of Problem and Substantiation for Public Comment**

Editorial change recommended to improve the applicability of this section.

**Related Item**

- FR-8963

**Submitter Information Verification**

**Submitter Full Name:** Jason Fisher

**Organization:** Tesla Inc.

**Affiliation:** Solar Energy Industries Association (SEIA)

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Thu Aug 30 08:58:43 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7704-NFPA 70-2018

**Statement:** The addition of the term "end" after "energy storage component" clarifies the applicability of this section.

**Public Comment No. 1509-NFPA 70-2018 [ Section No. 708.54 ]****708.54 Selective Coordination.**

Critical operations power 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: See informational note figure 708.54 for an example of how critical operations power system overcurrent protective devices (OCPD'Ss) selectively coordinate with all supply-side OCPD's.*

*OCPD D selectively coordinates with OCPDs C, F, E, B and A.*

*OCPD C selectively coordinates with OCPDs F, E, B, and A.*

*OCPD F selectively coordinates with OCPD E.*

*OCPD B is not required to selectively coordinate with OCPD A because OCPD B is not a critical operations power system OCPD.*

*Informational Note Figure 708.54 Critical Operations Power System Selective Coordination*

*INSERT FIGURE HERE*

**Additional Proposed Changes**

| <u>File Name</u>                      | <u>Description</u>               | <u>Approved</u> |
|---------------------------------------|----------------------------------|-----------------|
| Informational_Note_Figure-708.54.docx | Informational Note Figure 708.54 |                 |

**Statement of Problem and Substantiation for Public Comment**

This public comment seeks only to provide clarity. The addition of an informational note with text and a figure provides significant clarity for the NEC user in the determination of how critical operations power system overcurrent protective devices (OCPD'Ss) selectively coordinate with all supply-side OCPD's.

**Related Item**

• PI 4135 • PI 4138

**Submitter Information Verification**

**Submitter Full Name:** James Dollard  
**Organization:** IBEW Local Union 98  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Wed Aug 29 09:39:16 EDT 2018  
**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR  
**Resolution:** SR-7622-NFPA 70-2018  
**Statement:** This second revision inserts an informational note with an associated figure to provide clarity for the NEC user in the determination of how emergency system overcurrent protective devices (OCPDs) selectively coordinate with all supply-side OCPDs.

**Public Comment No. 858-NFPA 70-2018 [ 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 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.

**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.

**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.

**Functional Grounded.**

A system that has an electrical reference to ground that is not solidly grounded.

**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.

**Additional Proposed Changes**

| <u>File Name</u> | <u>Description Approved</u> |
|------------------|-----------------------------|
| CN_205.pdf       | 70_CN205                    |

**Statement of Problem and Substantiation for Public Comment**

NOTE: This Public Comment appeared as CC Note No. 205 in the First Draft Report on First Revision No. 8868.

The Correlating Committee directs that First Revision 8868 be correlated throughout this Article and all uses of (grounded) be reviewed.

This action will be considered as a public comment.

The Correlating Committee directs that this first revision be sent to CMP-4 and CMP-5 for information.

**Related Item**

- First Revision No. 8868

**Submitter Information Verification**

**Submitter Full Name:** CC on NEC-AAC

**Organization:** NEC Correlating Committee

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Mon Aug 20 12:10:08 EDT 2018

**Committee:** NEC-P13

### Committee Statement

**Committee Action:** Rejected but see related SR

**Resolution:** [SR-7655-NFPA 70-2018](#)

**Statement:** CMP 13 has reviewed all definitions that contain the word "ground." The definition of "Grounded, Functionally" has been revised to correlate with the definition in Article 690.

**Correlating Committee Note No. 205-NFPA 70-2018 [ Detail ]****Submitter Information Verification**

**Submitter Full Name:** Erik Hohengasser

**Committee:**

**Submittal Date:** Fri May 11 12:34:21 EDT 2018

**Committee Statement and Meeting Notes**

**Committee Statement:** The Correlating Committee directs that First Revision 8868 be correlated throughout this Article and all uses of (grounded) be reviewed.

This action will be considered as a public comment.

The Correlating Committee directs that this first revision be sent to CMP-4 and CMP-5 for information.

[First Revision No. 8868-NFPA 70-2018 \[Detail\]](#)

**Ballot Results**

✔ **This item has passed ballot**

12 Eligible Voters

0 Not Returned

12 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

**Affirmative All**

Brunssen, James E.

Dressman, Kevin L.

Hickman, Palmer L.

Hittinger, David L.

Holub, Richard A.

Johnston, Michael J.

Kovacik, John R.

Manche, Alan

McDaniel, Roger D.

Pierce, James F.

Saporita, Vincent J.

Williams, David A.



## Public Comment No. 1811-NFPA 70-2018 [ Definition: Functional Grounded. ]

### **Functional- Grounded, Functionally .**

A system that has an electrical ground reference to ~~ground~~ for operational purposes that is not solidly grounded.

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

### **Statement of Problem and Substantiation for Public Comment**

CMP-4 revised a similar definition in 690.2 during the first revision to improve its applicability to systems in use today. This proposal simply aligns those changes with the use of this term in Article 712.

#### **Related Item**

• FR-8868 • FR-8734

### **Submitter Information Verification**

**Submitter Full Name:** Jason Fisher

**Organization:** Tesla Inc.

**Affiliation:** Solar Energy Industries Association (SEIA)

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Thu Aug 30 09:01:13 EDT 2018

**Committee:** NEC-P13

### **Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7655-NFPA 70-2018

**Statement:** CMP 13 has reviewed all definitions that contain the word "ground." The definition of "Grounded, Functionally" has been revised to correlate with the definition in Article 690.

**Public Comment No. 1876-NFPA 70-2018 [ Section No. 712.10 ]****712.10** Directory.**(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: ~~Multiple Installations with multiple co-located power production sources that are grouped shall be permitted to use a common designation on the directory be identified as a group(s). The plaque or directory shall not be required to identify each power source individually.~~*

**Statement of Problem and Substantiation for Public Comment**

Changes made to this section are part of a larger group of changes to other articles that are being recommended in an effort to harmonize all directory requirements for onsite sources. During the public input phase we submitted several inputs that were also being coordinated with changes being proposed to other fire and building codes. Our intention is to standardize and harmonize these requirements to address the situation where different onsite sources may be installed by different groups at different times. During the First Draft state we received significant input and support by both CMP-13 and CMP-4 to improve our inputs. This comment is related to several other comments that realign all the changes made in the First Draft to ensure all requirements remain harmonized across the different articles.

**Related Item**

- FR-7839

**Submitter Information Verification**

**Submitter Full Name:** Jason Fisher

**Organization:** Tesla Inc.

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Thu Aug 30 10:54:26 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7660-NFPA 70-2018

**Statement:** The exception in 712.10(B) has been revised to clarify that multiple power production sources grouped at one location can be identified on a directory as a group.

**Public Comment No. 1105-NFPA 70-2018 [ Section No. 712.37 ]****712.37** Directional Current Devices.

Disconnecting means ~~shall be~~ listed, ~~be or~~ marked for use in a single current direction, ~~and shall~~ only be used in the designated current direction ~~and only in circuits with directional current flow~~.

Informational Note: Examples of directional current devices are magnetically quenched contactors and semiconductor switches in overcurrent devices.

**Statement of Problem and Substantiation for Public Comment**

I agree with the author of the PI, this text is confusing. I'm not even sure what "be listed, be marked" is supposed to mean. It's not used anywhere else in the NEC. My guess is that what is trying to be communicated here is that if a disconnecting device is listed or marked for directional current flow then it needs to be oriented in the correct direction and used only in a circuit with directional current flow. I don't think the intent was to require that if there is directional current flow in a circuit that a disconnect in that circuit must be listed for directional current flow.

**Related Item**

- Public Input No. 3864-NFPA 70-2017

**Submitter Information Verification**

**Submitter Full Name:** MARVIN HAMON

**Organization:** HAMON ENGINEERING INC

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Wed Aug 22 17:49:12 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7662-NFPA 70-2018

**Statement:** The section has been editorially revised for additional clarity. The term "only in circuits with directional current flow" is not accepted since technical substantiation has not been provided.

**Public Comment No. 1106-NFPA 70-2018 [ Section No. 712.52(B) ]**

(B) Over 300 Volts.

DC microgrids operating at voltages greater than 300 volts dc shall be reference-grounded dc systems or ~~resistively~~ functionally grounded dc systems.

**Statement of Problem and Substantiation for Public Comment**

Resistively grounded was changed to functionally grounded in First Revision No. 8868-NFPA 70-2018 in 712.2.

**Related Item**

- First Revision No. 8868-NFPA 70-2018

**Submitter Information Verification**

**Submitter Full Name:** MARVIN HAMON

**Organization:** HAMON ENGINEERING INC

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Wed Aug 22 18:04:15 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7663-NFPA 70-2018

**Statement:** The term "resistively" has been changed to "functionally" to correlate with similar uses of the term throughout this article.

**Public Comment No. 1107-NFPA 70-2018 [ Section No. 712.55 ]****712.55** Ground Fault Detection Equipment.

Ungrounded, reference grounded, or ~~resistively~~ functional 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).

**Statement of Problem and Substantiation for Public Comment**

Resistively grounded was changed to functional grounded in First Revision No. 8868-NFPA 70-2018 in 712.2.

**Related Item**

- First Revision No. 8868-NFPA 70-2018

**Submitter Information Verification**

**Submitter Full Name:** MARVIN HAMON

**Organization:** HAMON ENGINEERING INC

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Wed Aug 22 18:06:27 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7664-NFPA 70-2018

**Statement:** The term “resistively” has been changed to “functionally” to correlate with similar uses of the term throughout this article.



## Public Comment No. 1085-NFPA 70-2018 [ Definition: Energy Storage System (ESS). [Excluding any Sub... ]

One or more components assembled together capable of storing energy and providing electrical energy into the premises wiring system or an electric power production and distribution network.

Informational Note No. 1: ESS(s) can include but is not limited to batteries, capacitors, and kinetic energy devices (e.g., flywheels and compressed air). 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 No. 2: These systems differ from other storage systems such as a UPS system, which is a power supply used to provide alternating current power to a load for some period of time in the event of a power failure.~~

### Statement of Problem and Substantiation for Public Comment

The way the code has been revised a UPS system that is 1kWh or less, which includes most UPS systems, will be exempt but UPS systems larger than 1kWh will have to be included under 706. This IN confuses that by implying that there is a type of energy storage, UPS, that is not an Energy Storage System for this code section. And since INs are not enforceable it will in the end serve no purpose other than to confuse users. Perhaps there needs to be a more enforceable exclusion for UPS systems regardless of size.

#### Related Item

- Public Input No. 2987-NFPA 70-2017

### Submitter Information Verification

**Submitter Full Name:** MARVIN HAMON

**Organization:** HAMON ENGINEERING INC

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Wed Aug 22 15:59:47 EDT 2018

**Committee:** NEC-P13

### Committee Statement

**Committee Action:** Rejected

**Resolution:** The informational note provides needed clarity between products which may contain a battery such as a UPS versus an ESS. ESS products have a specific Industry product safety standard which evaluates the suitability for this application.

**Public Comment No. 1413-NFPA 70-2018 [ Part I. ]****Part I. General****Statement of Problem and Substantiation for Public Comment**

This is a general comment for sections 695, 700, 701, 702 and 708. The placement of this comment, was chosen for simplicity.

Many First Draft revisions were accepted in specific Articles (695, 700, 701, 702 and 708), however, similar requirements exist between these Articles. Consider revising verbiage for requirements that are similar in multiple Articles so that the language is consistent between each Article. This would improve usability.

Examples of similar sections in different articles, where the verbiage is not consistent include:

700.1, 701.1, 702.1, 708.1  
700.4, 702.4  
700.5, 701.5, 708.24  
700.6, 701.6, 702.6  
700.7, 701.7, 702.7  
700.8, (requirement not part of 701), 700.20 (D)  
700.10, 701.10, 708.10  
700.12, 701.12, 708.20  
700.30, 708.50  
700.32, 695.3 (C)(3)

**Related  
Item**

• FR-7505 • FR-7507 • FR-7508 • FR-8095 • FR-7576 • FR-7580 • FR-8864 • FR-8901 • FR-7603 • FR-7606 • FR-8870 • FR-8980 • FR-7729

**Submitter Information Verification**

**Submitter Full Name:** Daniel Caron  
**Organization:** BR+A Consulting Engineers, LLC  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Tue Aug 28 10:02:43 EDT 2018  
**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected but held  
**Resolution:** This public input introduces a concept that has not had public review by being included in a related Input or First Revision as shown in the First Draft. Therefore, the action taken is to Reject but Hold as required by the Regulations Governing the Development of NFPA Standards section 4.4.8.3.1(a).

**Public Comment No. 1917-NFPA 70-2018 [ Part II. ]****Part II. Disconnecting Means Requirements for Sources****Statement of Problem and Substantiation for Public Comment**

The three repeating uses of Disconnecting Means is confusing and is an opportunity to improve. Revising the title of Part II clarifies that these requirements are specific to sources, and adding "ESS Source" to the beginning of 706.15 clarifies that the requirements of 706.15 (disconnecton, remote actuation, notification & marking, and partitions) apply to the ESS source output,

**Related Public Comments for This Document****Related Comment****Relationship**

[Public Comment No. 1942-NFPA 70-2018 \[Section No. 706.15\]](#)

[Public Comment No. 1942-NFPA 70-2018 \[Section No. 706.15\]](#)

**Related Item**

- FR-8942

**Submitter Information Verification**

**Submitter Full Name:** Phil Undercuffler

**Organization:** Outback Power Technologies

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Thu Aug 30 12:20:35 EDT 2018

**Committee:** NEC-P13

**Committee Statement**

**Committee Action:** Rejected

**Resolution:** The current title is appropriate as the requirements in Part II apply to "Disconnecting Means." The suggested title is vague and the meaning of "sources" is not understood.



## Public Comment No. 1797-NFPA 70-2018 [ New Part after V. ]

### **Part V. Electrochemical Energy Storage Systems**

Part V 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 storage components contained within a listed product.

### **706.XX Installation of Storage Batteries.**

Unless otherwise directed by this article, an electrochemical storage battery ESS shall comply with the applicable provisions of Article 480.

## **Statement of Problem and Substantiation for Public Comment**

While we support the move of the specific requirements for electrochemical batteries to 480, there should be a pointer directing installers and AHJs to 480. This comment would simply restore specific 2017 text deleted in the first revision process. It is our opinion that this title would be a better Part V title and that requirements for flow batteries should be sections within this Part V. Adding a pointer to Article 480 is also advised. This equipment will primarily be considered storage components of an ESS so the IN is suggested to further clarify that and to point out that some battery-based ESS will be part of listed equipment, while others will not.

### **Related Item**

• FR-8979 • PI-2989 • PI-2762

## **Submitter Information Verification**

**Submitter Full Name:** Jason Fisher

**Organization:** Tesla Inc.

**Affiliation:** Solar Energy Industries Association (SEIA)

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**City:**

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**Zip:**

**Submittal Date:** Thu Aug 30 08:31:06 EDT 2018

**Committee:** NEC-P13

## **Committee Statement**

**Committee Action:** Rejected

**Resolution:** Second revision 7683 eliminates the need for the proposed changes. Added Informational Note 2 in 706.1 clarifies the distinction between a battery storing energy and an energy storage system.



## Public Comment No. 702-NFPA 70-2018 [ Part V. ]

### Part V. Flow Battery Energy Storage Systems

Part V applies to ESSs composed of or containing flow batteries.

Informational Note: Due to the unique design features and difference in operating characteristics of flow batteries as compared with that of storage batteries such as lead acid or lithium ion batteries, the requirements for flow batteries have been included here rather than in Article 480.

### Statement of Problem and Substantiation for Public Comment

Flow batteries are the only technology covered in Article 706 rather than Article 480. Inclusion of an Information Note is helpful to explain the reason for this distinction.

#### Related Item

• FR8979 • FR8979

### Submitter Information Verification

**Submitter Full Name:** Laurie Florence

**Organization:** UL LLC

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Thu Aug 16 11:56:33 EDT 2018

**Committee:** NEC-P13

### Committee Statement

**Committee Action:** Accepted

**Resolution:** SR-7706-NFPA 70-2018

**Statement:** Flow batteries are the only battery technology covered in Article 706 rather than Article 480. Inclusion of an Information Note is helpful to explain the reason for this distinction.



## Public Comment No. 674-NFPA 70-2018 [ Part VI. ]

### Part VI. Other Energy Storage Technologies

The provisions of ~~Part V~~ Part VI apply to ESSs using other technologies intended to store energy and when there is a demand for electrical power to use the stored energy to generate the needed power.

### Statement of Problem and Substantiation for Public Comment

There is a typo. It should reference Part VI. Part V is for flow batteries.

#### Related Item

- FR8956

### Submitter Information Verification

**Submitter Full Name:** Laurie Florence

**Organization:** UL LLC

**Street Address:**

**City:**

**State:**

**Zip:**

**Submittal Date:** Tue Aug 14 22:16:16 EDT 2018

**Committee:** NEC-P13

### Committee Statement

**Committee Action:** Rejected but see related SR

**Resolution:** SR-7707-NFPA 70-2018

**Statement:** The section should reference Part VI instead of Part V.

"The provisions of" were editorially revised for clarity.