Residential Code (IRC)–(NEC)

RCCIWG and Electrical Technical Advisory Committee (TAC)
## 2017 National Electrical Code – Residential

### Electrical TAC

<table>
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<tr>
<th>#</th>
<th>Change No.</th>
<th>Section</th>
<th>Change Summary b/t 2014 NEC and 2017 NEC</th>
<th>Change Summary b/t 2014 NEC- and 2017 NEC</th>
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<tr>
<td>1</td>
<td>FR1236</td>
<td>250.122(B) [E3908.12]</td>
<td>Revision to provide additional clarity to increased proportional size</td>
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**Rule 61G20-2.002 2.** Technical amendments needed to accommodate the specific needs of this state include but are not limited to amendments to the Florida Building Code that provide for the following:  

a. Establish minimum life safety construction requirements to protect buildings and their occupants from fire, wind, flood, and storm surge using the latest technical research and engineering standards for buildings and materials products.  
b. Provide for flood protection provisions that are consistent with the latest flood protection requirements of the National Flood Insurance Program.  
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### Table: Amendments to Accommodate Florida Specific Needs

<table>
<thead>
<tr>
<th>Amendment Code</th>
<th>Section</th>
<th>Description</th>
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<tbody>
<tr>
<td>FR1502</td>
<td>310.15(A)(2)</td>
<td>Editorial change to add clarity to the section</td>
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<tr>
<td>FR1820</td>
<td>330.15</td>
<td>The text provides exposed installation of Type MC consistent with other wiring methods</td>
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<tr>
<td>FR1828</td>
<td>338.10(B)(4)</td>
<td>Revision to add language for Type SE cable with ungrounded conductor sizes 10 AWG and smaller</td>
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Revision for clarifying the size of drainage openings in damp or wet locations

Same as change between 2014 NEC and 2017 NEC

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Revision for wiring enclosure boxes where barriers are provided and spaces are resultant

Same as change between 2014 NEC and 2017 NEC

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Revision to add language for non-metallic-sheathed cable or multiconductor Type UF cable and installation properties

Same as change between 2014 NEC and 2017 NEC

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**Report Page 4**
Rule 61G20-2.002 2. Technical amendments needed to accommodate the specific needs of this state include but are not limited to amendments to the Florida Building Code that provide for the following:

- Establish minimum life safety construction requirements to protect buildings and their occupants from fire, wind, flood, and storm surge using the latest technical research and engineering standards for buildings and materials products.
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| FR2408 | 314.19  
| E3905.5 |
| 10 FR2408 | 314.19  
| E3905.5 |
| 11 FR2417 | 404.9(B)  
| E4001.11.1 |
| 12 FR2418 | 404.14(F)  
| E4001.14 |
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Add Informational Note 4 which refers readers to other codes related to flood provisions.

Same as change between 2014 NEC and 2017 NEC.

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<td>28</td>
<td>FR4876</td>
<td>422.16(B)(1) [E4101.3]</td>
<td>Revises to clarify definition by adding “on or above the ground”</td>
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<td>29</td>
<td>FR601</td>
<td>300.3(B)(1) [E3406.7], [E3803.8]</td>
<td>Revises to add clarity on “neutral and ungrounded conductors” within the exception</td>
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<td>30</td>
<td>FR602</td>
<td>300.3(B)(4) Exception [E3801]</td>
<td>Revises addition of Panelboard to the title of the subsubsection</td>
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<td>Revised to provide protection for raceway, cable and conductor directly buried installations.</td>
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<td>Revised to provide needed consistency and correlation with other requirements in the code.</td>
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<td>33</td>
<td>FR609</td>
<td>300.5(J)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>[E3803.9]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Revised to insert “Cables and conductors” to clarify that the directly buried cables and conductors may be formed into “S” loops.</td>
<td></td>
<td>Same as change between 2014 NEC and 2017 NEC</td>
</tr>
</tbody>
</table>
Technical amendments needed to accommodate the specific needs of this state include but are not limited to amendments to the Florida Building Code that provide for the following:

- Establish minimum life safety construction requirements to protect buildings and their occupants from fire, wind, flood, and storm surge using the latest technical research and engineering standards for buildings and materials products.
- Provide for flood protection provisions that are consistent with the latest flood protection requirements of the National Flood Insurance Program.
- Provide for energy efficiency standards for buildings that meet or exceed the national energy standards as mandated by Title III of the Energy Conservation and Protection Act.
- Maintain coordination with the Florida Fire Prevention Code.
- Provide for the latest industry standards and design.

### Table

<table>
<thead>
<tr>
<th>Rule Number</th>
<th>FR</th>
<th>Action</th>
<th>Accommodate Florida Specific Need:</th>
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</thead>
<tbody>
<tr>
<td>34</td>
<td>FR61</td>
<td>Revised to remove “Metal or nonmetallic” since the use of the terms, “metal” and “nonmetallic” cover all raceways anyway.</td>
<td>Yes (Select Criteria) NO:</td>
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<tr>
<td>35</td>
<td>FR619</td>
<td>Revised to change “appliance” to “utilization equipment” to more closely match the definitions in Article 100.</td>
<td>Yes (Select Criteria) NO:</td>
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<tr>
<td>36</td>
<td>FR628</td>
<td>Revises the title to Table 725.154 to include CMUC that is covered in the table and revises the table to include the permitted use of cable routing assemblies as Permitted by 90A.</td>
<td>Yes (Select Criteria) NO:</td>
</tr>
</tbody>
</table>

Rule 61G20-2.002 2. Technical amendments needed to accommodate the specific needs of this state include but are not limited to amendments to the Florida Building Code that provide for the following:  

- Establish minimum life safety construction requirements to protect buildings and their occupants from fire, wind, flood, and storm surge using the latest technical research and engineering standards for buildings and materials products.  
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- Provide for energy efficiency standards for buildings that meet or exceed the national energy standards as mandated by Title III of the Energy Conservation and Protection Act.  
- Maintain coordination with the Florida Fire Prevention Code.  
- Provide for the latest industry standards and design.
Rule 61G20-2.002 2. Technical amendments needed to accommodate the specific needs of this state include but are not limited to amendments to the Florida Building Code that provide for the following:  

a. Establish minimum life safety construction requirements to protect buildings and their occupants from fire, wind, flood, and storm surge using the latest technical research and engineering standards for buildings and materials products.  
b. Provide for flood protection provisions that are consistent with the latest flood protection requirements of the National Flood Insurance Program.  
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f. Provide for the latest industry standards and design
Rule 61G20-2.002 2. Technical amendments needed to accommodate the specific needs of this state include but are not limited to amendments to the Florida Building Code that provide for the following:

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b. Provide for flood protection provisions that are consistent with the latest flood protection requirements of the National Flood Insurance Program.
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e. Maintain coordination with the Florida Fire Prevention Code.
f. Provide for the latest industry standards and design

### Amendment Details

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<thead>
<tr>
<th>Amendment</th>
<th>Description</th>
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<tr>
<td>Rule 61G20-2.002 2.</td>
<td>Technical amendments needed to accommodate the specific needs of this state include but are not limited to amendments to the Florida Building Code that provide for the following: a. Establish minimum life safety construction requirements to protect buildings and their occupants from fire, wind, flood, and storm surge using the latest technical research and engineering standards for buildings and materials products. b. Provide for flood protection provisions that are consistent with the latest flood protection requirements of the National Flood Insurance Program. c. Maintain eligibility for federal funding and discounts from the National Flood Insurance Program, the Federal Emergency Management Agency, and the United States Department of Housing and Urban Development. d. Provide for energy efficiency standards for buildings that meet or exceed the national energy standards as mandated by Title III of the Energy Conservation and Protection Act. e. Maintain coordination with the Florida Fire Prevention Code. f. Provide for the latest industry standards and design</td>
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<tr>
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<tbody>
<tr>
<td>SCR22</td>
<td>Adds reconditioned equipment exception language for industrial occupancies and labeled “Reconditioned”</td>
</tr>
<tr>
<td>FR43</td>
<td>Removes the ambiguous language “and/or” to natural code language</td>
</tr>
<tr>
<td>SCR54</td>
<td>Revises switching requirements on where the grounded circuit conductors can be installed, adds an exception to address limitations on neutral currents, adds new requirement for switching devices to meet 404.22 and gives the new effective date for these new requirements.</td>
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</table>
Revises the section to add the phrase “metal components” to each subdivision to correct a transcription error and isolated sections of metal conduit that meet the requirements of this section are considered to be metal components.

<table>
<thead>
<tr>
<th>Rule 61G20-2.002 2.</th>
<th>Technical amendments needed to accommodate the specific needs of this state include but are not limited to amendments to the Florida Building Code that provide for the following:</th>
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<tbody>
<tr>
<td>a.</td>
<td>Establish minimum life safety construction requirements to protect buildings and their occupants from fire, wind, flood, and storm surge using the latest technical research and engineering standards for buildings and materials products.</td>
</tr>
<tr>
<td>b.</td>
<td>Provide for flood protection provisions that are consistent with the latest flood protection requirements of the National Flood Insurance Program.</td>
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<tr>
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<td>Provide for energy efficiency standards for buildings that meet or exceed the national energy standards as mandated by Title III of the Energy Conservation and Protection Act.</td>
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<td>e.</td>
<td>Maintain coordination with the Florida Fire Prevention Code.</td>
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<td>f.</td>
<td>Provide for the latest industry standards and design.</td>
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<th>Commission Action</th>
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<td>Yes (Select Criteria) NO:</td>
<td>Yes (Select Criteria) NO:</td>
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<td>a. b. c. d. e. f.</td>
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<tr>
<th>43</th>
<th>SR1217</th>
<th>250.86 [E3908.1]</th>
<th>Same as change between 2014 NEC and 2017 NEC</th>
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<tr>
<th>44</th>
<th>SR14</th>
<th>110.26(E)(2)Exception [3405.5]</th>
<th>Adds Exception to (b): Structural overhangs or roof extensions shall be permitted in this zone. Removed vague language “suitable”</th>
<th>Same as change between 2014 NEC and 2017 NEC</th>
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<th>45</th>
<th>SR16</th>
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<th>Removes Item (3)</th>
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<table>
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<tr>
<th>46</th>
<th>SR17</th>
<th>110.28 [E3404.4]</th>
<th>Reference current SDO in Informational Note 2</th>
<th>Same as change between 2014 NEC and 2017 NEC</th>
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<td>RCCIWG – Comment</td>
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</table>
### Rule 61G20-2.002

Technical amendments needed to accommodate the specific needs of this state include but are not limited to amendments to the Florida Building Code that provide for the following:

- Establish minimum life safety construction requirements to protect buildings and their occupants from fire, wind, flood, and storm surge using the latest technical research and engineering standards for buildings and materials products.
- Provide for flood protection provisions that are consistent with the latest flood protection requirements of the National Flood Insurance Program.
- Provide for energy efficiency standards for buildings that meet or exceed the national energy standards as mandated by Title III of the Energy Conservation and Protection Act.
- Maintain coordination with the Florida Fire Prevention Code.
- Provide for the latest industry standards and design.

#### RCCIWG – Comment

**47 SR1802**

<table>
<thead>
<tr>
<th>320.30(A)</th>
<th>Revises this section to remove Type 2S and Types 21S and chooses to add “labeled” to the cable ties segment for clarity and usability.</th>
<th>Same as change between 2014 NEC and 2017 NEC</th>
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| [E3803.11] | (TAC Action)

#### RCCIWG – Comment

**48 SR1807**

<table>
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<tr>
<th>330.30(A)</th>
<th>Revises this section to remove Type 2S and Types 21S and adds &quot;listed, labeled and identified for securement and support&quot; to provide information to the AHJ regarding the suitability of equipment they encounter.</th>
<th>Same as change between 2014 NEC and 2017 NEC</th>
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| [E3802.6] | (TAC Action)

#### RCCIWG – Comment

**49 SR2401**

<table>
<thead>
<tr>
<th>312.8</th>
<th>Revised to allow the wiring space within enclosures and overcurrent devices to be permitted for other wiring and equipment subject to the limitations for specific equipment as provided in (A) or (B).</th>
<th>Same as change between 2014 NEC and 2017 NEC</th>
</tr>
</thead>
</table>
| [E3907.1] | (TAC Action)
Rule 61G20-2.002 2. Technical amendments needed to accommodate the specific needs of this state include but are not limited to amendments to the Florida Building Code that provide for the following:  
   a. Establish minimum life safety construction requirements to protect buildings and their occupants from fire, wind, flood, and storm surge using the latest technical research and engineering standards for buildings and materials products.  
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### TAC Action

<table>
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<tr>
<th>ACCOMMODATE FLORIDA SPECIFIC NEED:</th>
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### Commission Action

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<tbody>
<tr>
<td>NO:</td>
</tr>
<tr>
<td>Others (Explain):</td>
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</table>

---

### Revised to make an editorial changes.

- Same as change between 2014 NEC and 2017 NEC

### Revised to include similar work surfaces as a part of a wall space.

- Same as change between 2014 NEC and 2017 NEC
Rule 61G20-2.002 2. Technical amendments needed to accommodate the specific needs of this state include but are not limited to amendments to the Florida Building Code that provide for the following:

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b. Provide for flood protection provisions that are consistent with the latest flood protection requirements of the National Flood Insurance Program.


d. Provide for energy efficiency standards for buildings that meet or exceed the national energy standards as mandated by Title III of the Energy Conservation and Protection Act.

e. Maintain coordination with the Florida Fire Prevention Code.

f. Provide for the latest industry standards and design
**Rule 61G20-2.002**

Technical amendments needed to accommodate the specific needs of this state include but are not limited to amendments to the Florida Building Code that provide for the following:

- Establish minimum life safety construction requirements to protect buildings and their occupants from fire, wind, flood, and storm surge using the latest technical research and engineering standards for buildings and materials products.
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<td><strong>Impactful (Explain)</strong></td>
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<td>YES (Select Criteria) NO:</td>
<td>YES (Select Criteria) NO:</td>
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<td>a. b. c. d. e. f.</td>
</tr>
<tr>
<td>Others (Explain):</td>
<td>Others (Explain):</td>
<td>Others (Explain):</td>
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</table>

**62 SR310**

210.52(D) [E3901.6]

Revised to allow for receptacle outlet assemblies listed for use in countertops to be allowed to be installed in the countertop.

**63 SR316**

210.8(A)(7) [E3902.7], [E3902.5]

Revised to require sinks where receptacles are installed within 6ft from the top inside edge of the bowl of the sink to have a ground fault circuit interrupter.

**64 SR317**

210.8(E) [E3902.4]

GFCI protection for crawl space lighting outlets has been relocated from 210.70(C)

Same as change between 2014 NEC and 2017 NEC

No Action Needed

Overlapping provisions
Rule 61G20-2.002 2. Technical amendments needed to accommodate the specific needs of this state include but are not limited to amendments to the Florida Building Code that provide for the following:

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### Amendments

<table>
<thead>
<tr>
<th>Rule</th>
<th>Code</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>65</td>
<td>SR320</td>
<td>210.12(B)</td>
<td>Revised to require outlets installed in dorms to be protected by any of the means described in 210.12(A)(1) through (6)</td>
<td>No Action Needed</td>
</tr>
<tr>
<td>66</td>
<td>SR325</td>
<td>210.70(A)(2) [E3903.3]</td>
<td>Revised to allow lighting outlets to be controlled by dimmer switches if they provided the full range of dimming control at each location.</td>
<td>No Action Needed</td>
</tr>
<tr>
<td>67</td>
<td>SR326</td>
<td>210.52(G)(1) [E3901.9]</td>
<td>The language related to outlets outside of the garage has been deleted from this section to correlate with changes made to 210.11(C)(4).</td>
<td>Same as change between 2014 NEC and 2017 NEC</td>
</tr>
</tbody>
</table>
Rule 61G20-2.002 2. Technical amendments needed to accommodate the specific needs of this state include but are not limited to amendments to the Florida Building Code that provide for the following:

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d. Provide for energy efficiency standards for buildings that meet or exceed the national energy standards as mandated by Title III of the Energy Conservation and Protection Act.

e. Maintain coordination with the Florida Fire Prevention Code.

f. Provide for the latest industry standards and design.

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<th>Rule</th>
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<tr>
<td>68</td>
<td>422.16(B)(2) (E4101.3)</td>
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<tr>
<td>69</td>
<td>422.16(B)(4) (E4101.3)</td>
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<td>70</td>
<td>422.18 (E4101.6)</td>
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Same as change between 2014 NEC and 2017 NEC.
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<th>Commission Action</th>
<th>Impactful (Explain)</th>
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<tr>
<td>71 SR5101</td>
<td>406.9(A) [E4002.8]</td>
<td>Revision to make change to standard reference in Informational note</td>
<td>Same as change between 2014 NEC and 2017 NEC</td>
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<tr>
<td>72 SR5102</td>
<td>406.9(B)(1) [E4002.9]</td>
<td>Revision for box hoods in wet locations of 15 and 20 amperes to be labeled extra duty. Editorial revisions also included in SR</td>
<td>Same as change between 2014 NEC and 2017 NEC</td>
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<tr>
<td>73 SR5106</td>
<td>406.5(E) [E4002.7], [E4002.6]</td>
<td>Revision to reword to clarify to only apply to horizontally mounted receptacle assemblies</td>
<td>Same as change between 2014 NEC and 2017 NEC</td>
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f. Provide for the latest industry standards and design.
Rule 61G20-2.002 Technical amendments needed to accommodate the specific needs of this state include but are not limited to amendments to the Florida Building Code that provide for the following:

a. Establish minimum life safety construction requirements to protect buildings and their occupants from fire, wind, flood, and storm surge using the latest technical research and engineering standards for buildings and materials products.

b. Provide for flood protection provisions that are consistent with the latest flood protection requirements of the National Flood Insurance Program.


d. Provide for energy efficiency standards for buildings that meet or exceed the national energy standards as mandated by Title III of the Energy Conservation and Protection Act.

e. Maintain coordination with the Florida Fire Prevention Code.

f. Provide for the latest industry standards and design...
(B) Increased in Size.

Where if ungrounded conductors are increased in size for any reason from the minimum size that has sufficient ampacity for the intended installation—before the application of any adjustment or correction factor(s), wire-type equipment grounding conductors, where installed, shall be increased in size proportionately according to the circular mil area. The increase in size shall be in the same proportion as the increase in the size of the ungrounded conductors using their circular mil area.

Committee Statement

Committee Statement: The revised text provides additional clarity.

Response Message:

Statement of Problem and Substantiation for Public Input

In an attempt to clarify this section in the last revision cycle, it appears an error was made. Equipment grounding conductors are subject to the same environmental conditions as the ungrounded and grounded conductors they supplement or support. Thus they must be increased in size in the same proportion as grounded and ungrounded conductors are. Changes proposed for the new last sentence are intended to be an editorial improvement.

Statement of Problem and Substantiation for Public Input

According to 'NEC 2014 Analysis of Changes' workbook: “the equipment grounding conductors are not required to be increased in size when the ungrounded conductors are already installed oversized or above the minimum sizes required for sufficient ampacity for the intended load.” Increasing the grounding conductor size proportionate to the ungrounded conductor size is always the right thing to do. For voltage drop, we need to ensure the grounding conductor has the ampacity to safely carry a fault current. If the ungrounded conductors were increased in size where voltage drop was not a concern, the increased area of the ungrounded conductors increases the available fault current values present at the oversized ungrounded conductors location thus necessitates the proportionately increased circular mil area of the grounding conductor.

X

Affirmative with Comment

Beckstrand, Gary A.

The NEC text was revised by the committee to read as follows: “(B) Increased in Size. If ungrounded conductors are increased in size for any reason, from the minimum size that has sufficient ampacity for the intended installation wire-type equipment grounding conductors shall be increased in size. The increase in size shall be at least in the same proportion as the increase in the size of the ungrounded conductors using their circular mil area.” and not as currently shown in Terra. the phase "from the minimum size that has sufficient ampacity for the intended installation," should be crossed out and removed from the text.

Bowmer, Trevor N.
In 250.122(B), the text should revised further to read “shall be at least in the same proportion” and not as currently stated “...shall be in the same proportion”.

Brett, Jr., Martin J.
250.122(B) There seems to be a sense that the words should be “shall be at least in the same proportion” and not “shall be in the same proportion”.

Edwards, Timothy
See attached errata

Harding, G. Scott
250.122 (B). The revised text could be improved if stated as follows: If ungrounded conductors are increased in size for any reason from the minimum size that has sufficient ampacity for the intended installation other than an increase due to the application of any adjustment or correction factor(s), wire-type equipment grounding conductors, where installed, shall be increased in size proportionately according to the circular mil area. The increase in size shall be at least in the same proportion as the increase in the size of the ungrounded conductors using their circular mil area.

Harding, Joseph
FR 1236 – 250.122(B) There seems to be a sense that the words should be “shall be at least in the same proportion” and not shall be in the same proportion.

Mohla, Daleep C.
There seems to be a sense that the words should be “shall be at least in the same proportion” and not shall be in the same proportion

Palmieri, Charles J.
FR 1236 – 250.122(B) There seems to be a sense that the words should be “shall be at least in the same proportion” and not shall be in the same proportion.

Philips, Nathan
Based on the panel discussion, my view is that the requirement for increasing conductor size should be limited to cases where the increase is due to voltage drop. There was no technical basis presented for increasing the EGC when the other conductors are increased for reasons related to increased heat because the conductor should not need to carry current for more than a few seconds, at worst, in a fault condition.
First Revision No. 15-NFPA 70-2015 [ Section No. 110.26(A) ]

(A) Working Space.

Working space for equipment operating at 600 1000 volts, nominal, or less to ground and likely to require examination, adjustment, servicing, or maintenance while energized shall comply with the dimensions of 110.26(A)(1), (A)(2), and (A)(3), and (A)(4) or as required or permitted elsewhere in this Code.

Informational Note: NFPA 70E -2015, Standard for Electrical Safety in the Workplace, provides guidance, such as determining severity of potential exposure, planning safe work practices, arc flash labeling, and selecting personal protective equipment.

Global FR-18

(1) Depth of Working Space.

The depth of the working space in the direction of live parts shall not be less than that specified in Table 110.26(A)(1) unless the requirements of 110.26(A)(1)(a), (A)(1)(b), or (A)(1)(c) are met. Distances shall be measured from the exposed live parts or from the enclosure or opening if the live parts are enclosed.

Table 110.26(A)(1) Working Spaces

<table>
<thead>
<tr>
<th>Nominal Voltage to Ground</th>
<th>Minimum Clear Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Condition 1</td>
</tr>
<tr>
<td>0–150</td>
<td>914 900 mm (3 ft)</td>
</tr>
<tr>
<td>151–600</td>
<td>914 900 mm (3 ft)</td>
</tr>
<tr>
<td>601–1000</td>
<td>900 mm (3 ft)</td>
</tr>
</tbody>
</table>

Note: Where the conditions are as follows:

**Condition 1** — Exposed live parts on one side of the working space and no live or grounded parts on the other side of the working space, or exposed live parts on both sides of the working space that are effectively guarded by insulating materials.

**Condition 2** — Exposed live parts on one side of the working space and grounded parts on the other side of the working space. Concrete, brick, or tile walls shall be considered as grounded.

**Condition 3** — Exposed live parts on both sides of the working space.

(a) **Dead-Front Assemblies.** Working space shall not be required in the back or sides of assemblies, such as dead-front switchboards, switchgear, or motor control centers, where all connections and all renewable or adjustable parts, such as fuses or switches, are accessible from locations other than the back or sides. Where rear access is required to work on nonelectrical parts on the back of enclosed equipment, a minimum horizontal working space of 762 mm (30 in.) shall be provided.

(b) **Low Voltage.** By special permission, smaller working spaces shall be permitted where all exposed live parts operate at not greater than 30 volts rms, 42 volts peak, or 60 volts dc.

(c) **Existing Buildings.** In existing buildings where electrical equipment is being replaced, Condition 2 working clearance shall be permitted between dead-front switchboards, switchgear, panelboards, or motor control centers located across the aisle from each other where conditions of maintenance and supervision ensure that written procedures have been adopted to prohibit equipment on both sides of the aisle from being open at the same time and qualified persons who are authorized will service the installation.
(2) Width of Working Space.

The width of the working space in front of the electrical equipment shall be the width of the equipment or 762 mm (30 in.), whichever is greater. In all cases, the work space shall permit at least a 90 degree opening of equipment doors or hinged panels.

(3) Height of Working Space.

The work space shall be clear and extend from the grade, floor, or platform to a height of 2.0 m (6 1\(\frac{1}{2}\) ft) or the height of the equipment, whichever is greater. Within the height requirements of this section, other equipment that is associated with the electrical installation and is located above or below the electrical equipment shall be permitted to extend not more than 150 mm (6 in.) beyond the front of the electrical equipment.

*Exception No. 1:* In existing dwelling units, service equipment or panelboards that do not exceed 200 amperes shall be permitted in spaces where the height of the working space is less than 2.0 m (6 1\(\frac{1}{2}\) ft).

*Exception No. 2:* Meters that are installed in meter sockets shall be permitted to extend beyond the other equipment. The meter socket shall be required to follow the rules of this section.

*Exception No. 3:* On battery systems mounted on open racks, the top clearance shall comply with 480.9(D).

(4) Limited Access.

Where equipment operating at 1000 volts, nominal, or less to ground and likely to require examination, adjustment, servicing, or maintenance while energized is located in a space with limited access, all of the following shall apply:

(a) Where equipment is installed above a lay-in ceiling, there shall be an opening not smaller than 559 mm × 559 mm (22 in. × 22 in.), or in a crawl space, there shall be an accessible opening not smaller than 559 mm × 762 mm (22 in. × 30 in.).

(b) The width of the working space shall be the width of the equipment enclosure or a minimum of 762 mm (30 in.), whichever is greater.

(c) All enclosure doors or hinged panels shall be capable of opening a minimum of 90 degrees.

(d) The space in front of the enclosure shall comply with the depth requirements of Table 110.26(A)(1). The maximum height of the working space shall be the height necessary to install the equipment in the limited space. A horizontal ceiling structural member or access panel shall be permitted in this space.

(5) Separation from High-Voltage Equipment.

Where switches, cutouts, or other equipment operating at 1000 volts, nominal, or less are installed in a vault, room, or enclosure where there are exposed live parts or exposed wiring operating over 1000 volts, nominal, the high-voltage equipment shall be effectively separated from the space occupied by the low-voltage equipment by a suitable partition, fence, or screen.

Submitter Information Verification

*Submitter Full Name:* CMP 1

*Organization:* [Not Specified]

*Street Address:*
Committee Statement

Committee Statement: This first revision:

1. Adds an Informational Note to reference NFPA 70E after the parent text in 110.26 since it applies to multiple first level subdivisions in 110.26 and working space is required for equipment that is likely to require examination, adjustment, servicing, or maintenance while energized.

2. Adds a third exception to 110.26(A)(3) to correlate with battery systems in 480.9(D) for the working space required above top terminal batteries installed on tiered racks.

3. Adds new second level subdivision “110.26(A)(4) Limited Access” that addresses equipment “located in a space with limited access” mandating four requirements: (1) above a lay-in ceiling, (2) width of the working space, (3) doors or hinged panels be capable of opening a minimum of 90 degrees, and (4) space in front of the enclosure. This required the last sentence of 110.26(A) to be clarified for this new list item.

4. Adds a new less than 1000-volt requirement as 110.26(A)(5) for “Separation from High-Voltage Equipment” correlates with similar provisions for over 1000 volts in Part III 110.31(A). The change of “600 volts” to “1000 volts” in 110.26(A) and new 110.26(A)(4) was made to correlate with similar changes to Table 110.26(A)(1) and new 110.26(A)(5).

Items 1 and 3 above originate from the work of a Correlating Committee Task Group to address the action taken by CMP-17 on section 424.66 about (1) requirements for adequate working space for equipment that is likely to require examination, adjustment, servicing, or maintenance while energized being general requirements and should be in 110.26, (2) avoiding possible confusion from other Code-making Panels that may implement similar, but differing requirements, (3) requirements for working space in spaces with limited access that must be practical, feasible and enforceable, and (4) addressing a single general requirement in Chapter 1 for all impacted equipment to provide clarity and usability of the NEC. The Panel recommends the Correlating Committee forward FR-15 to CMP-17 for public comment relative to deleting the limited access working space requirements in 424.66.

Item 4 above originates from the work of a Correlating Committee Task Group to: (1) resolve issues with actions taken by Code-making Panels 1 and 8 on proposals and comments in the 2014 NEC cycle relative to changing the voltage threshold in articles under their purview from 600 volts to 1000 volts, (2) address indoor and outdoor electrical substations, and (3) evaluate other higher voltage threshold requirements to be included relative to present trends.

Response Message:

Public Input No. 1065-NFPA 70-2014 [Section No. 110.26]

This public input is the work of a task group appointed by the NEC Correlating Committee to review requirements for working space of equipment that is often installed in spaces with limited access. The task group was charged with reviewing the revision to section 424.66 during the 2014 NEC revision cycle (see comment 17-19) and to explore the feasibility of a new general requirement for the 2017 NEC in Article 110 for clarity and usability. The task group members were Susan Scearce, Robert Osborne, Chad Kennedy, Keith Lofland, Jeff Holmes, Randy Hunter, Donny Cook, Don Jhson, Duke Schamel, David Hittinger, Neil LaBrake and James Dollard. The concerns of the Correlating Committee were discussed. The CC formed this task group to address the concerns of the CMP-17 Chair and another committee member. The task group reviewed the action taken by CMP-17 on section 424.66 and agreed that a general
requirement in 110.26 was necessary for several reasons; (1) Requirements for adequate working space for equipment that is likely to require examination, adjustment, servicing, or maintenance while energized are general requirements and belong in section 110.26, (2) In the next revision cycle other CMP’s may implement similar requirements that may differ slightly creating potential conflicts and possible confusion, (3) Requirements for working space in spaces with limited access must be practical, feasible and enforceable, and; (4) A single general requirement in Chapter 1 to address all impacted equipment would provide clarity, usability and eliminate potential conflict and confusion. The task group recognizes that this revision is necessary for correlation throughout the NEC, and to provide the relief necessary for installations with limited access. The task group understands that the rules as presently written in 110.26 apply to all equipment that is likely to require examination, adjustment, servicing, or maintenance while energized. It is widely understood that strict compliance with 110.26(A)(1), (A)(2) and (A)(3) in ceiling spaces and crawl spaces is not feasible. The task group recommends that all committees are sent the CMP-1 action on this proposal public input whether accepted, accepted with changes or rejected for correlation in other Articles.

Suggested new Informational Note The first suggested revision is a new Informational Note to reference NFPA 70E. The task group understands that working space is required for equipment that is likely to require examination, adjustment, servicing, or maintenance while energized. Therefore an Informational Note to reference NFPA 70E Standard for Electrical Safety in the Workplace is appropriately located after the parent text in 110.26. The task group originally located this Informational Note after the proposed new requirement but quickly realized that it applies to multiple first level subdivisions in 110.26. Suggested new text in 110.26(A) The second suggested revision is a new last sentence in the parent text to 110.26(A) as follows: “Working space for equipment permitted elsewhere in this Code to be installed in spaces with limited access such as above a ceiling, in elevated areas that are not readily accessible, or in crawl spaces shall comply with 110.26(A)(4). This proposed revision leaves the first sentence of 110.26(A) unchanged as the general requirement for all equipment requiring workspace clearances. The new second sentence will modify the general rule for specific equipment that is "installed in spaces with limited access". This equipment “installed in spaces with limited access” is further limited with the text “such as above a ceiling, in elevated areas that are not readily accessible, or in crawl spaces” to provide clarity. Suggested new second level subdivision 110.26(A)(4) A new second level subdivision “110.26(A)(4) Limited Access”, is added with basic parent text that is similar to the first sentence in 110.26(A). This parent text limits the scope of this subdivision to equipment “located in a space with limited access” and this mandates that all of the following four list items shall apply. Suggested new 110.26(A)(4)(1) The first list item requires that equipment installed above a lay-in ceiling have access through an opening not smaller than 559 mm x 559 mm (22 in. x 22 in.) which recognizes a standard 2 foot x 2 foot lay-in ceiling opening. Additionally, a crawl space is required to be accessible through an opening not smaller than 559 mm x by 762 mm (22 in. x by 30 in.). These dimensions for the crawl space are similar to the access requirements for signs in 600.21(E) with dimensions that correlate with the applicable building codes and spaces between standard framing. Suggested new 110.26(A)(4)(2) The second list item requires the width of the working space to be the width of the enclosure, or a minimum of 762 mm (30 in.), whichever is greater. Suggested new 110.26(A)(4)(3) The third list item requires all doors or hinged panels be capable of opening a minimum of 90 degrees. Suggested new 110.26(A)(4)(4) The fourth list item requires the space in front of the enclosure comply with the depth requirements of Table 110.26(A)(1). This list item provides relief from the general height requirement and permits the height of the working space to be the maximum height necessary to install the equipment in the limited space. This list item also recognizes relief necessary in most ceiling spaces and permits a horizontal ceiling structural member or access panel in this space. Summary All electrical equipment referenced in 110.26(A) requires working space in accordance with the requirements therein without regard to where the equipment is installed. The task group recognizes that where equipment referenced in 110.26(A) is installed in spaces with limited access, such as above a ceiling, meeting the requirements of 110.26(A) will in most cases be impossible. The proposed revision recognizes that; (1) 110.26(A) requires working space for equipment located in spaces with limited access, (2) Strict compliance with 110.26(A) will in almost all cases be
infeasible (3) The electrical industry has been installing equipment in such spaces for decades
(4) Prescriptive requirements for such spaces are needed This proposed revision is an attempt
to provide relief for both the installer/maintainer and the AHJ. This task group was formed by
the NEC Correlating Committee in an attempt to eliminate correlation issues across multiple
committees. In order to achieve this goal, the task group has provided a suggested general
requirement for such spaces in Article 110 under the purview of CMP-1. It is the opinion of the
task group that all purview over working space clearances should reside with CMP-1. An
alternate approach to address this issue is to provide individual code making panels with
purview over working space clearances of equipment within their purview where it is located in
spaces with limited access. If CMP-1 rejects the inclusion of a general requirement in 110.26 for
spaces with limited access the NEC Correlating Committee should consider standardized text
for such requirements across multiple committees. A companion public input is sent to CMP-17
to delete the limited access working space requirements in 424.66. This deletion would be
conditional based upon the actions of CMP-1 to include a general requirement for spaces with
limited access.

Public Input No. 1513-NFPA 70-2014 [New Section after 110.26(A)(3)]

This Public Input was developed by a Task Group assigned by the NEC Correlating Committee
to: (1) resolve issues with actions taken by Code-making Panels 1 and 8 on proposals and
comments in the 2014 NEC cycle relative to changing the voltage threshold in articles under
their purview from 600 volts to 1000 volts, (2) address indoor and outdoor electrical substations,
and (3) evaluate other higher voltage threshold requirements to be included relative to present
trends. Members of the Task Group on Over 600 volts for this Public Input included: Alan
Manche; Donny Cook; Vince Saporita; Lanny Floyd; Paul Barnhart; Eddie Guidry; Alan
Peterson; Tom Adams; David Kendall; Dave Mercier; Tim Pope; and co-chairs Roger McDaniel
and Neil F. LaBrake, Jr.; including ad-hoc members Larry Cogburn, CMP-8 Chair and Ken
Boyce, CMP-1 Chair. This proposed change adds a new requirement to the list in 110.26(A) for
“Separation from Low-Voltage Equipment.” This change is needed to correlate with companion
Public Inputs to Part III.

Public Input No. 3263-NFPA 70-2014 [Section No. 110.26(A)(3)]

A new Exception No. 3 is added to direct the reader back to Article 480 for top clearance. NEC
480.9(C) states that “spaces about battery systems shall comply with 110.26.” But then480.9(C)
goes on to prescribe “spaces about battery systems.” 480.9(D) addresses the working space
required above top terminal batteries installed on tiered racks.
(5) Equipment Bonding Grounding Conductors.

Where parallel equipment bonding grounding conductors are used, they shall be sized in accordance with 250.122. Sectioned equipment bonding grounding conductors smaller than 1/0 AWG shall be permitted in multiconductor cables, provided that if the combined circular mil area of the sectioned equipment bonding grounding conductors in each cable complies with 250.122.

Committee Statement

Committee Statement: PI 3476 adds clarity and complies with the Style Manual.

Response Message:

Statement of Problem and Substantiation for Public Input

The change from "grounding" to "bonding" in the 2014 NEC was inadvertent. CMP-6 accepted the change only if CMP-5 accepted changing from "equipment grounding conductor" to "equipment bonding conductor". Since CMP-5 did not accept that change, the TCC directed that ROP 6-13 be recorded as a "reject". Therefore, the change from "grounding" to "bonding" was in error and needs to be changed back.
(2) Selection of Ampacity.
Where more than one ampacity applies for a given circuit length, the lowest value shall be used.

Exception: Where two different ampacities apply to adjacent portions of a circuit, the higher ampacity shall be permitted to be used beyond the point of transition, a distance equal to if the total portion(s) of the circuit with lower ampacity does not exceed the lesser of 3.0 m (10 ft) or 10 percent of the circuit length figured at the higher ampacity, whichever is less total circuit.

Informational Note: See 110.14(C) for conductor temperature limitations due to termination provisions.

Committee Statement

Committee: The present text of 310.15(A)(2) is correct, and the ampacity of that portion of the circuit with higher ampacity may be used for the circuit ampacity, even if one or more parts of the circuit have lower ampacity, as long as the total of the parts with lower ampacity do not exceed the lesser of 10 ft. or 10% of the total circuit length. The parts of the circuit with lower ampacity do not have to be adjacent. This exception should not be used in conjunction with 310.15(B)(3)(a).

Response Message:

Statement of Problem and Substantiation for Public Input
1) Subsection general requirement, as reworded, is just more proper use of grammar and implements no change.
2) Exception wording change provides for additional possibilities excluded under current wording. Portions of the circuit beyond the immediately adjacent portion are excluded for establishing 10% of the higher ampacity length or as the ampacity value permitted to be extended past the transition.

As an example, let's say we have a two-wire circuit 50' in length from panelboard to load. The wires exit the panelboard enclosure through a conduit 4' in length containing 10 current-carrying conductors, are then routed 2' through a wireway with less than 30 current-carrying conductors, then continue in a conduit by themselves to the load but in a higher ambient temperature. The circuit uses the same size and type of conductor throughout.

The conductor ampacity for the portion between panelboard and wireway would likely have the lowest value with 50% factoring for 10 current-carrying conductors. The Exception, as currently worded, can not be applied to this portion because the adjacent portion in the wireway is only 2' in length. Even if we could carry a higher ampacity across more than one adjacent portion, the portion between wireway to load is 44', and 10% past the transition at the wireway does not cover the 6' distance to the panelboard.

Through the Exception, as reworded, the portion between panelboard and wireway can be excluded from circuit ampacity determination because it is less than 10% of the consecutively adjacent portions with higher ampacity. Circuit ampacity is permitted to be that of the load-end portion of the circuit (likely the second lowest ampacity portion, having to be corrected for the higher ambient temperature).
330.15  Exposed Work.

Exposed runs of cable, except as provided in 300.11(A), shall closely follow the surface of the building finish or of running boards. Exposed runs shall also be permitted to be installed on the underside of joists where supported at each joist and located so as not to be subject to physical damage.

Committee Statement

Committee Statement: The text provides exposed installation of Type MC consistent with other wiring methods.

Response Message:

Statement of Problem and Substantiation for Public Input

Currently similar cable products [e.g. 320.15-AC Cable and 334.15-NM-B Cable] have guidance for the installation of "Exposed Work" it would seem logical that Metal-Clad Cable also be afforded those same installation specifications. While AC Cable does have a metallic sheath that meets Section 250.118 and standard interlocking MC Cable does not (generally speaking) they are both subject to the same level of physical damage. Care should be taken when installing any armored cable in exposed installations and this proposal helps establish a safe installation practice which is the scope of the National Electrical Code.
### 338.10(B)(4) Installation Methods for Branch Circuits and Feeders

#### (a) Interior Installations

In addition to the provisions of this article, Type SE service-entrance cable used for interior wiring shall comply with the installation requirements of Part II of Article 334, excluding 334.80.

Where Type SE cable with ungrounded conductor sizes 10 AWG and smaller, where installed in thermal insulation, the ampacity shall be in accordance with 60°C (140°F) conductor temperature rating. The maximum conductor temperature rating shall be permitted to be used for ampacity adjustment and correction purposes, if the final derated ampacity does not exceed that for a 60°C (140°F) rated conductor.

- Informational Note No. 1: See 310.15(A)(3) for temperature limitation of conductors.
- Informational Note No. 2: For the installation of main power feeder conductors in dwelling units refer to 310.15(B)(7).

#### (b) Exterior Installations

In addition to the provisions of this article, service-entrance cable used for feeders or branch circuits, where installed as exterior wiring, shall be installed in accordance with Part I of Article 225. The cable shall be supported in accordance with 334.30. Type USE cable installed as underground feeder and branch circuit cable shall comply with Part II of Article 340.

**Exception:** Single-conductor Type USE and multi-rated USE conductors shall not be subject to the ampacity limitations of Part II of Article 340.

### Committee Statement

**Committee Statement:** This change will align smaller SE cables with NM cables as related to heat dissipation when installed in thermal insulation. The fact that SE cables typically have a 75 degree temperature rating and connected to 75 degree rated equipment terminations, it seems logical that SE cables should be permitted to be used at their 75 degree ampacity in accordance with 310.15. The #8 and larger SE cables have been used for decades installed in thermal insulation without documented reports of failures strictly due to being in this type of environment.

**Response Message:**

### Statement of Problem and Substantiation for Public Input

The limitations to 60C should only apply to sizes used for small conductor installations. SE cable is listed according to UL854 and is typically listed at 75C with 90C insulated conductors. SE cable is commonly available in copper 8 AWG and larger and aluminum 6 AWG and larger. The smaller sizes are often used in residential applications to feed large appliances such as stoves and dryers. Appliance receptacles sized 30 amps and larger are listed and marked for use at 75C with both copper and aluminum. Therefore, the breaker, cable and receptacles are all suitable for use at 75C. NM cable is frequently used for smaller devices such as receptacles and switches that are listed for use at 60C. Non-metallic sheathed cable (NM-B) was limited to 60C in the 1980s because of the overheating that occurred in lighting fixtures in ceilings after thermal insulation was blown on top of the conductors and fixtures in the 1970s. The trapped heat from the light fixtures (which were commonly overlamped) caused heat related damage to...
the 60C insulation in NM cable. Therefore, the industry decided to require 90C insulation but still limit NM cable to 60C. If SE cable is used for a similar installation, it would be reasonable to limit its ampacity to correlate with the temperature limitations of the devices and lighting fixtures. However, there is no logical or technical reason to restrict SE cable ampacity for larger conductor applications.

**Negative with Comment**

La Dart, Samuel R.

There is no substantiation given for this. There has been no testing to show that there is not a overheating problem with this cable in insulation.

Straniero, George A.

No technical substantiation was provided to exempt larger sized Type SE cable from the ampacity requirements of 334.80 where the cable is installed in thermal insulation. Exemption of the ampacity requirement based on the size of the conductors is not technically substantiated. The panel has requested technical support for several code cycles showing that Type SE cable behaves differently NM or UF cable when installed in thermal insulation. No such information has been provided. Revision based on size does not address concern for overheating where larger sized cables are installed in thermal insulation. If anything larger sized cables with larger and more continuous loads are more of a concern.
314.15 Damp or Wet Locations.

In damp or wet locations, boxes, conduit bodies, outlet box hoods, and fittings shall be placed or equipped so as to prevent moisture from entering or accumulating within the box, conduit body, or fitting. Boxes, conduit bodies, outlet box hoods, and fittings installed in wet locations shall be listed for use in wet locations. Approved drainage openings not smaller than 3 mm (\(\frac{1}{8}\) in.) and not larger than 6 mm (\(\frac{1}{4}\) in.) in diameter shall be permitted to be installed in the field in boxes or conduit bodies listed for use in damp or wet locations. For installation of listed drain fittings, larger openings are permitted to be installed in the field in accordance with manufacturer’s instructions.

Informational Note No. 1: For boxes in floors, see 314.27(B).

Informational Note No. 2: For protection against corrosion, see 300.6.

Committee Statement

Committee: CMP 9 is adding specifications on the sizing and geometry of the "drainage" openings allowed in the current NEC text. Holes that are smaller than 1/8 inch do not comply with applicable standards because they can easily be blocked over time, and a square hole would exceed the intended maximum area. The code text does not specify acceptable enclosure types because there is nothing wrong with using a more robust enclosure with field-supplied weep holes, installed for "drainage" purposes, if it is actually applied in a NEMA 3R environment. For example, an enclosure additionally rated for a sleet exposure might still have a weep hole drilled on its underside. A NEMA 6P enclosure could not have a weep hole drilled in the field because the hole would provide the opposite of drainage unless the actual application were not submerged.

Response Message:

Statement of Problem and Substantiation for Public Input

Some boxes and conduit bodies that are listed for Wet Locations are permitted (per 12.22 of trinational standard NMX-J-023/1-ANCE • CSA-C22.2 NO. 18.1-13 • UL 514A, per 92.1.15 of standard UL 514C, per 7.2.1 of trinational standard NMX-J-017-ANCE • CSA-C22.2 NO. 18.3-12 • UL 514B) to be additionally rated for Enclosure Type ratings specified in trinational standard CAN/CSA-C22.2 No. 94.2-07, UL 50E, or NMX-J-235/2-ANCE-2007. Trinational standard CAN/CSA-C22.2 No. 94.2-07, UL 50E, or NMX-J-235/2-ANCE-2007 and NEMA Standard 250 limit field-applied drainage openings to Enclosure Types 2 (not outdoors), 3R, and 3RX. Therefore, acceptance of Proposal 9-35 and Comment 9-29 in the last Code cycle erred in not accounting for boxes so limited by the manufacturers' designs and the certifiers' listings in field-applied drainage openings. Furthermore, trinational standard CAN/CSA-C22.2 No. 94.2-07, UL 50E, or NMX-J-235/2-ANCE-2007 and NEMA Standard 250 limit the SIZE of such field-applied drainage openings to NOT SMALLER than 3.2 mm (\(\frac{1}{8}\) in.) and not larger than 6.4 mm (\(\frac{1}{4}\) in.) in DIAMETER. The minimum hole size is to mitigate drainage holes from being blocked. The present specification in 314.15 could conceivably be a square opening, resulting in an opening of 21.5% larger area than the round hole in these long-established standards. While this is not a major difference, it would conflict with manufacturers' instructions included in their listings and conflict with NEC® 110.3(B).
First Revision No. 2406-NFPA 70-2015 [ Section No. 314.16(A) ]

(A) Box Volume Calculations.

The volume of a wiring enclosure (box) shall be the total volume of the assembled sections and, where used, the space provided by plaster rings, domed covers, extension rings, and so forth, that are marked with their volume or are made from boxes the dimensions of which are listed in Table 314.16(A). Where a box is provided with one or more securely installed barriers, the volume shall be apportioned to each of the resulting spaces. Each barrier, if not marked with its volume, shall be considered to take up 8.2 cm $^3$ (1.0 in $^3$) if metal, and 16.4 cm $^3$ (1.0 in $^3$) if nonmetallic.

(1) Standard Boxes.

The volumes of standard boxes that are not marked with their volume shall be as given in Table 314.16(A).

(2) Other Boxes.

Boxes 1650 cm $^3$ (100 in. $^3$) or less, other than those described in Table 314.16(A), and nonmetallic boxes shall be durably and legibly marked by the manufacturer with their volume(s). Boxes described in Table 314.16(A) that have a volume larger than is designated in the table shall be permitted to have their volume marked as required by this section.

Table 314.16(A) Metal Boxes

<table>
<thead>
<tr>
<th>Box Trade Size</th>
<th>Minimum Volume</th>
<th>Maximum Number of Conductors $^a$ (arranged by AWG size)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>cm $^3$</td>
<td>in. $^3$</td>
</tr>
<tr>
<td>100 $\times$ 32</td>
<td>205</td>
<td>12.5</td>
</tr>
<tr>
<td>100 $\times$ 38</td>
<td>254</td>
<td>15.5</td>
</tr>
<tr>
<td>100 $\times$ 54</td>
<td>353</td>
<td>21.5</td>
</tr>
<tr>
<td>100 $\times$ 54</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 $\times$ 54</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 $\times$ 54</td>
<td></td>
<td></td>
</tr>
<tr>
<td>120 $\times$ 32</td>
<td>418</td>
<td>25.5</td>
</tr>
<tr>
<td>120 $\times$ 38</td>
<td>484</td>
<td>29.5</td>
</tr>
<tr>
<td>120 $\times$ 54</td>
<td>689</td>
<td>42.0</td>
</tr>
<tr>
<td>75 $\times$ 50 $\times$ 38</td>
<td>123</td>
<td>7.5</td>
</tr>
<tr>
<td>75 $\times$ 50 $\times$ 50</td>
<td>164</td>
<td>10.0</td>
</tr>
<tr>
<td>75 $\times$ 50 $\times$ 57</td>
<td>172</td>
<td>10.5</td>
</tr>
<tr>
<td>75 $\times$ 50 $\times$ 65</td>
<td>205</td>
<td>12.5</td>
</tr>
<tr>
<td>75 $\times$ 50 $\times$ 70</td>
<td>230</td>
<td>14.0</td>
</tr>
<tr>
<td>75 $\times$ 50 $\times$ 90</td>
<td>295</td>
<td>18.0</td>
</tr>
<tr>
<td>100 $\times$ 54 $\times$ 38</td>
<td>169</td>
<td>10.3</td>
</tr>
<tr>
<td>100 $\times$ 54 $\times$ 48</td>
<td>213</td>
<td>13.0</td>
</tr>
<tr>
<td>100 $\times$ 54 $\times$ 54</td>
<td>238</td>
<td>14.5</td>
</tr>
<tr>
<td>95 $\times$ 50 $\times$ 65</td>
<td>230</td>
<td>14.0</td>
</tr>
<tr>
<td>95 $\times$ 50 $\times$ 90</td>
<td>344</td>
<td>21.0</td>
</tr>
</tbody>
</table>
Box Trade Size | Minimum Volume | Maximum Number of Conductors*
---|---|---
| mm | in. | cm³ | in.³ | 18 | 16 | 14 | 12 | 10 | 8 | 6 | 4 | 2
| min. 44.5 depth | FS — single cover /gang (1 1/4) | 221 | 13.5 | 9 | 7 | 6 | 6 | 5 | 4 | 2 | 1 | 0
| min. 60.3 depth | FD — single cover /gang (2 3/8) | 295 | 18.0 | 12 | 10 | 9 | 8 | 7 | 6 | 3 | 2 | 1
| min. 44.5 depth | FS — multiple cover /gang (1 1/4) | 295 | 18.0 | 12 | 10 | 9 | 8 | 7 | 6 | 3 | 2 | 1
| min. 60.3 depth | FD — multiple cover /gang (2 3/8) | 395 | 24.0 | 16 | 13 | 12 | 10 | 9 | 8 | 4 | 2 | 1

*Where no volume allowances are required by 314.16(B)(2) through (B)(5).

(B) Box Fill Calculations.

The volumes in paragraphs 314.16(B)(1) through (B)(5), as applicable, shall be added together. No allowance shall be required for small fittings such as locknuts and bushings. Each space within a box installed with a barrier shall be calculated separately.

(1) Conductor Fill.

Each conductor that originates outside the box and terminates or is spliced within the box shall be counted once, and each conductor that passes through the box without splice or termination shall be counted once. Each loop or coil of unbroken conductor not less than twice the minimum length required for free conductors in 300.14 shall be counted twice. The conductor fill shall be calculated using Table 314.16(B). A conductor, no part of which leaves the box, shall not be counted.

Exception: An equipment grounding conductor or conductors or not over four fixture wires smaller than 14 AWG, or both, shall be permitted to be omitted from the calculations where they enter a box from a domed luminaire or similar canopy and terminate within that box.

(2) Clamp Fill.

Where one or more internal cable clamps, whether factory or field supplied, are present in the box, a single volume allowance in accordance with Table 314.16(B) shall be made based on the largest conductor present in the box. No allowance shall be required for a cable connector with its clamping mechanism outside the box.

A clamp assembly that incorporates a cable termination for the cable conductors shall be listed and marked for use with specific nonmetallic boxes. Conductors that originate within the clamp assembly shall be included in conductor fill calculations covered in 314.16(B)(1) as though they entered from outside the box. The clamp assembly shall not require a fill allowance, but the volume of the portion of the assembly that remains within the box after installation shall be excluded from the box volume as marked in 314.16(A)(2).

(3) Support Fittings Fill.

Where one or more luminaire studs or hickeys are present in the box, a single volume allowance in accordance with Table 314.16(B) shall be made for each type of fitting based on the largest conductor present in the box.

(4) Device or Equipment Fill.

For each yoke or strap containing one or more devices or equipment, a double volume allowance in accordance with Table 314.16(B) shall be made for each yoke or strap based on the largest conductor connected to a device(s) or equipment supported by that yoke or strap. A device or utilization equipment wider than a single 50 mm (2 in.) device box as described in Table 314.16(A) shall have double volume allowances provided for each gang required for mounting.

Table 314.16(B) Volume Allowance Required per Conductor

| Size of Conductor (AWG) | Free Space Within Box for Each Conductor |
Committee Statement

Committee Statement: CMP 9 concludes that the text needs to better address volume calculation in boxes with internal barriers. Nonmetallic box barriers are generally provided with volume markings, but steel barriers for metal boxes are not at present; the prescriptive text provided here allows for an orderly transition, based on a simple volume calculation of 4 x 2 x 1/16 inches for steel, and double that for plastic.

This is a simple solution that avoids changes to the table. Device boxes are supplied as individual boxes and then ganged in the field; the current text makes clear that wiring volumes after ganging are not to be applied box by box. At one time some handbooks described allowable cable entries in terms of cables entering each component box instead as the total enclosed volume as intended; by placing the word "gang" into the table this misinterpretation would likely reoccur.

The change in (2) proposed in the input, which would only apply to very large FS and FD boxes (five-gang and over FD boxes; six-gang and over FS boxes) is adequately covered in the product standards and there is no evidence of a field problem. The volume of a subdivided floor box would need to be determined by the manufacturer and checked as part of the listing process, and here again this should be addressable in the product standard.

Response Message:

Statement of Problem and Substantiation for Public Input

To clarify the requirements where multi-gang boxes or where boxes with wiring compartments separable by barriers are employed. Table 314.16(A) is inconsistent in that a portion of the existing rows (masonry, FS, FD) reflect "gang" for multi-gang boxes whereas the portion of rows for device boxes do not reflect common availability as multi-gang boxes. Furthermore, floor boxes and multi-service raised-floor boxes have barriered wiring compartments that are not equal (i.e., not symmetrical) in wiring volumes for each compartment. Consequently, the requirement for "TOTAL volume of the assembled SECTIONS" have resulted in some interpretations where more meaningful volume markings for INDIVIDUAL device gangs or INDIVIDUAL device wiring barriered compartments have been rejected.
Affirmative with Comment

Hartwell, Frederic P.

See MS Word file submitted separately for the material formatted with legislative text. For the benefit of members of the public reading these actions, the change creating a conditional plural for the word "volume(s)" in (A)(2) was not voted by CMP 9 and should be regarded as an erratum; no changes were intended or voted to this paragraph and the word should remain "volume". For the benefit of the members of the public reading these actions, the panel action on this first revision to 314.16(B) was fully substantiated in accordance with 4.3.9.2.2 of the Regulations Governing the Development of NFPA Standards. Although omitted from this ballot, the following statement was voted to support this revision: "The parent language in 314.16 requires box sizing calculations to be made by comparing the interior volume of boxes with the required volume allowances specified for the contents of those boxes. The first revision to 314.16(A) made by CMP 9 in response to Public Input 2692 addresses for the first time the procedure for calculating the volume of the interior spaces of boxes divided by barriers installed in the field. This revision is a necessary complement to that action and clarifies that the required volume allowances for divided boxes are to be applied as applicable on the basis of the contents of each subdivided section."

Humphrey, David G.

Panel Statement should read as follows. The parent language in 314.16 requires box sizing calculations to be made by comparing the interior volume of boxes with the required volume allowances specified for the contents of those boxes. The first revision to 314.16(A) made by CMP 9 in response to Public Input 2692 addresses for the first time the procedure for calculating the volume of the interior spaces of boxes divided by barriers installed in the field. This revision is a necessary complement to that action and clarifies that the required volume allowances for divided boxes are to be applied as applicable on the basis of the contents of each subdivided section."

Miller, Kevin R.

See MS Word file submitted separately for the material formatted with legislative text. For the benefit of members of the public reading these actions, the change creating a conditional plural for the word "volume(s)" in (A)(2) was not voted by CMP 9 and should be regarded as an erratum; no changes were intended or voted to this paragraph and the word should remain "volume". For the benefit of the members of the public reading these actions, the panel action on this first revision to 314.16(B) was fully substantiated in accordance with 4.3.9.2.2 of the Regulations Governing the Development of NFPA Standards. Although omitted from this ballot, the following statement was voted to support this revision: "The parent language in 314.16 requires box sizing calculations to be made by comparing the interior volume of boxes with the required volume allowances specified for the contents of those boxes. The first revision to 314.16(A) made by CMP 9 in response to Public Input 2692 addresses for the first time the procedure for calculating the volume of the interior spaces of boxes divided by barriers installed in the field. This revision is a necessary complement to that action and clarifies that the required volume allowances for divided boxes are to be applied as applicable on the basis of the contents of each subdivided section."

Osborne, Robert D.

See MS Word file submitted separately for the material formatted with legislative text. For the benefit of members of the public reading these actions, the change creating a conditional plural for the word "volume(s)" in (A)(2) was not voted by CMP 9 and should be regarded as an erratum; no changes were intended or voted to this paragraph and the word should remain "volume". For the benefit of the members of the public reading these actions, the panel action on this first revision to 314.16(B) was fully substantiated in accordance with 4.3.9.2.2 of the Regulations Governing the Development of NFPA Standards. Although omitted from this ballot, the following statement was voted to support this revision: "The parent language in 314.16 requires box sizing calculations to be made by comparing the interior volume of boxes with the required volume allowances specified for the contents of those boxes. The first revision to 314.16(A) made by CMP 9 in response to Public Input 2692 addresses for the first time the procedure for calculating the volume of the interior spaces of boxes divided by barriers installed in the field. This revision is a necessary complement to that action and clarifies that the required volume allowances for divided boxes are to be applied as applicable on the basis of the contents of each subdivided section."


barriers installed in the field. This revision is a necessary complement to that action and clarifies that the required volume allowances for divided boxes are to be applied as applicable on the basis of the contents of each subdivided section.

Young, Ralph H.

for the material formatted with legislative text. For the benefit of members of the public reading these actions, the change creating a conditional plural for the word “volume(s)” in (A)(2) was not voted by CMP 9 and should be regarded as an erratum; no changes were intended or voted to this paragraph and the word should remain “volume”. For the benefit of the members of the public reading these actions, the panel action on this first revision to 314.16(B) was fully substantiated in accordance with 4.3.9.2.2 of the Regulations Governing the Development of NFPA Standards. Although omitted from this ballot, the following statement was voted to support this revision: “The parent language in 314.16 requires box sizing calculations to be made by comparing the interior volume of boxes with the required volume allowances specified for the contents of those boxes. The first revision to 314.16(A) made by CMP 9 in response to Public Input 2692 addresses for the first time the procedure for calculating the volume of the interior spaces of boxes divided by barriers installed in the field. This revision is a necessary complement to that action and clarifies that the required volume allowances for divided boxes are to be applied as applicable on the basis of the contents of each subdivided section.”
(B) Metal Boxes and Conduit Bodies.

Where metal boxes or conduit bodies are installed with messenger-supported wiring, open wiring on insulators, or concealed knob-and-tube wiring, conductors shall enter through insulating bushings or, in dry locations, through flexible tubing extending from the last insulating support to not less than 6 mm ( 1⁄4 in.) inside the box and beyond any cable clamps. Where nonmetallic-sheathed cable or multiconductor Type UF cable is used, the sheath shall extend not less than 6 mm ( 1⁄4 in.) inside the box and beyond any cable clamp. Except as provided in 300.15(C), the wiring shall be firmly secured to the box or conduit body. Where raceway or cable is installed with metal boxes or conduit bodies, the raceway or cable shall be secured to such boxes and conduit bodies.

Committee Statement

Committee Statement: The NEC does not presently provide a minimum cable sheath requirement for the metal boxes with cable clamps, as is addressed in 314.17(C) for nonmetallic boxes. This wording will provide a comparable requirement and assure that the cable clamp will not bear on unprotected conductors.

Statement of Problem and Substantiation for Public Input

The same protection for conductors is needed when cables enter a metal box as it is for cables entering nonmetallic boxes, as addressed in 314.17(C).

Statement of Problem and Substantiation for Public Input

The sheath should extend into the box and beyond the clamp in order to protect the insulated conductors. This requirement is the same as the existing requirement for nonmetallic boxes.
314.19 Boxes Enclosing Flush Devices.

Boxes used to enclose flush devices shall be of such design that the devices will be completely enclosed on back and sides and substantial support for the devices will be provided. Screws for supporting the box shall not also be used in attachment of the device contained therein to attach a device.

Committee Statement

**Committee Statement:** This revision is editorial in nature and simplifies the wording of the requirement.

**Response Message:**

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

NEC_StyleManual_2011.pdf: 3.3.4 Word Clarity. Words and terms used in the NEC shall be specific and clear in meaning, and shall avoid jargon, trade terminology, industry-specific terms, or colloquial language that is difficult to understand. NEC language shall be brief, clear, and emphatic. The following are examples of old-fashioned expressions and word uses that shall not be permitted: "therein"
Grounding.

Snap switches, including dimmer and similar control switches, shall be connected to an equipment grounding conductor and shall provide a means to connect metal faceplates to the equipment grounding conductor, whether or not a metal faceplate is installed. Metal faceplates shall be grounded. Snap switches shall be considered to be part of an effective ground-fault current path if either of the following conditions is met:

1. The switch is mounted with metal screws to a metal box or metal cover that is connected to an equipment grounding conductor or to a nonmetallic box with integral means for connecting to an equipment grounding conductor.

2. An equipment grounding conductor or equipment bonding jumper is connected to an equipment grounding termination of the snap switch.

**Exception No. 1 to (B):** Where no means exists within the snap-switch enclosure for connecting to the equipment grounding conductor, or where the wiring method does not include or provide an equipment grounding conductor, a snap switch without a connection to an equipment grounding conductor shall be permitted for replacement purposes only. A snap switch wired under the provisions of this exception and located within 2.5 m (8 ft) vertically, or 1.5 m (5 ft) horizontally, of ground or exposed grounded metal objects shall be provided with a faceplate of nonconducting noncombustible material with nonmetallic attachment screws, unless the switch mounting strap or yoke is nonmetallic or the circuit is protected by a ground-fault circuit interrupter.

**Exception No. 2 to (B):** Listed kits or listed assemblies shall not be required to be connected to an equipment grounding conductor if all of the following conditions are met:

1. The device is provided with a nonmetallic faceplate that cannot be installed on any other type of device,

2. The device does not have mounting means to accept other configurations of faceplates,

3. The device is equipped with a nonmetallic yoke, and

4. All parts of the device that are accessible after installation of the faceplate are manufactured of nonmetallic materials.

**Exception No. 3 to (B):** A snap switch with integral nonmetallic enclosure complying with 300.15(E) shall be permitted without a connection to an equipment grounding conductor.

**Committee Statement**

The first sentence of 404.9(B) requires that the snap switches provide capability to connect an installed metal faceplate to the equipment grounding conductor but nothing in this requirement mandates that the metal faceplate itself be actually bonded to the equipment grounding conductor. While typical metal faceplates normally rely on the bare metal underside of the screw heads pressing on bare metal of the faceplate to conductively bond the metal faceplate to the grounded switch yoke, many aftermarket "solutions" impose nonconductive material (decorative wallpaper, contact paper, plastic attachments, etc.) that preclude the metal faceplate from being actually bonded to the equipment grounding conductor. A loose conductor would then energize the floating...
Response
Message:

Statement of Problem and Substantiation for Public Input
Equivalent to 406.6(B) for receptacles. The first sentence of 404.9(B) requires that the snap switches provide CAPABILITY to connect an installed metal faceplate to the equipment grounding conductor but nothing in this requirement mandates that the METAL FACEPLATE ITSELF be actually bonded to the equipment grounding conductor. While typical metal faceplates NORMALLY rely on the bare metal underside of the screw heads pressing on bare metal of the faceplate to conductively bond the metal faceplate to the grounded switch yoke, many aftermarket "solutions" impose NONCONDUCTIVE material (decorative wallpaper, contact paper, plastic attachments, etc.) that preclude the metal faceplate from being actually bonded to the equipment grounding conductor. A loose conductor would then energize the floating metal faceplate. See http://www.pgeveryday.com/home-garden/home-decor/article/3-crafty-ways-to-decorate-light-switches?utm_source=sse&utm_medium=email&utm_content=m1_get_the_instructions&utm_campaign=oct8_light_switches for a typical decoration example that would defeat bonding of metal switch faceplates to the equipment grounding conductor.
(F) Cord- and Plug-Connected Loads.

Where a snap switch or control device is used to control cord- and plug-connected equipment on a general-purpose branch circuit, each snap switch or control device controlling receptacle outlets or cord connectors that are supplied by permanently connected cord pendants shall be rated at not less than the rating of the maximum permitted ampere rating or setting of the overcurrent device protecting the receptacles or cord connectors, as provided in 210.21(B).

Informational Note: See 210.50(A) and 400.10(A)(1) for equivalency to a receptacle outlet of a cord connector that is supplied by a permanently connected cord pendant.

Exception: Where a snap switch or control device is used to control not more than one receptacle on a branch circuit, the switch or control device shall be permitted to be rated at not less than the rating of the receptacle.

Committee Statement

Committee Statement: There are many occupancy sensing and time based automatic control devices available that are rated for use for specific fixed lighting loads and these ratings may be less then the overcurrent protection of the branch circuit. Therefore to ensure safety and reduce fire hazard, automatic control devices controlling a branch circuit serving these receptacles (as mentioned in 406.3(E)) must be rated and listed to safely operate all the loads that may be connected to the receptacles up to the ampere rating of the overcurrent protection of the branch circuit.

Response Message:

Affirmative with Comment

Hornberger, Barry N.

The information note in FR 2418 refers the reader to 210.50(A) and 400.10(A)(1). 400.10(A)(1) does not exist. The reference to 400.7(A)(1) is appropriate. Notes from NFPA Liaison at Hilton Head recorded the informational note for 404.14(F) to read as follows:

Informational Note: See 210.50(A) and 400.7(A)(1) for equivalency to a receptacle outlet of a cord connector that is supplied by a permanently connected cord pendant.
(3) Bathroom Branch Circuits.

In addition to the number of branch circuits required by other parts of this section, at least one 120-volt, 20-ampere branch circuit shall be provided to supply the bathroom(s) receptacle outlet(s). Such circuits shall have no other outlets.

Exception: Where the 20-ampere circuit supplies a single bathroom, outlets for other equipment within the same bathroom shall be permitted to be supplied in accordance with 210.23(A)(1) and (A)(2).

(4) Garage Branch Circuits.

In addition to the number of branch circuits required by other parts of this section, at least one 20-ampere branch circuit shall be provided to supply garage receptacle outlet(s).

Committee Statement

Committee Statement: The word "a" that was added in the 2014 edition is singular and limits the required 20 amp branch circuit to serve only one bathroom's receptacle outlets. This, thereby, requires a separate 20 amp branch circuit for each bathroom's receptacle outlets. The proposed revision clarifies that the required 20 amp branch circuit is permitted to serve the receptacle outlets in more than one bathroom.

Add (C)(4) Many appliance and tools used in dwelling unit garages are rated at 12 to 16 amperes or higher and demand at least a 20 ampere rated branch circuit. A 15 ampere rated branch circuit in the modern dwelling unit garage is typically not sufficient. While most residential electricians are already installing 20 ampere rated branch circuits in dwelling unit garages, the NEC currently does not require or demand this 20 ampere rating.

Response Message:

Statement of Problem and Substantiation for Public Input

Many appliance and tools used in dwelling unit garages are rated at 12 to 16 amperes or higher and demand at least a 20 ampere rated branch circuit. A 15 ampere rated branch circuit in the modern dwelling unit garage is typically not sufficient. While most residential electricians are already installing 20 ampere rated branch circuits in dwelling unit garages, the NEC currently does not require or demand this 20 ampere rating.

Statement of Problem and Substantiation for Public Input

The word "a" that was added in the 2014 edition is singular and limits the required 20 amp branch circuit to serve only one bathroom's receptacle outlets. This, thereby, requires a separate 20 amp branch circuit for each bathroom's receptacle outlets. The proposed revision clarifies that the required 20 amp branch circuit is permitted to serve the receptacle outlets in more than one bathroom.
First Revision No. 337-NFPA 70-2015 [ Section No. 215.2(A)(1) ]

(1) General.

Feeder conductors shall have an ampacity not less than required to supply the load as calculated in Parts III, IV, and V of Article 220. Conductors shall be sized to carry not less than the larger of 215.2(A)(1)(a) or (b).

(a) Where a feeder supplies continuous loads or any combination of continuous and noncontinuous loads, the minimum feeder conductor size shall have an allowable ampacity not less than the noncontinuous load plus 125 percent of the continuous load.

Exception No. 1: If the assembly, including the overcurrent devices protecting the feeder(s), is listed for operation at 100 percent of its rating, the allowable ampacity of the feeder conductors shall be permitted to be not less than the sum of the continuous load plus the noncontinuous load.

Exception No. 2: Where a portion of a feeder is connected at both its supply and load ends to separately installed pressure connections as covered in 110.14(C)(2), it shall be permitted to have an allowable ampacity not less than the sum of the continuous load plus the noncontinuous load. No portion of a feeder installed under the provisions of this exception shall extend into an enclosure containing either the feeder supply or the feeder load terminations, as covered in 110.14(C)(1).

Exception No. 3: Grounded conductors that are not connected to an overcurrent device shall be permitted to be sized at 100 percent of the continuous and noncontinuous load.

(b) The minimum feeder conductor size shall have an allowable ampacity not less than the maximum load to be served after the application of any adjustment or correction factors.

Informational Note No. 1: See Examples D1 through D11 in Informative Annex D.

Informational Note No. 2: Conductors for feeders, as defined in Article 100, sized to prevent a voltage drop exceeding 3 percent at the farthest outlet of power, heating, and lighting loads, or combinations of such loads, and where the maximum total voltage drop on both feeders and branch circuits to the farthest outlet does not exceed 5 percent, will provide reasonable efficiency of operation.

Informational Note No. 3: See 210.19(A); Informational Note No. 4, for voltage drop for branch circuits.

Exception No. 1: If the assembly, including the overcurrent devices protecting the feeder(s), is listed for operation at 100 percent of its rating, the allowable ampacity of the feeder conductors shall be permitted to be not less than the sum of the continuous load plus the noncontinuous load.

Exception No. 2: Grounded conductors that are not connected to an overcurrent device shall be permitted to be sized at 100 percent of the continuous and noncontinuous load.

Committee Statement

Committee Exception (1) and (2) is moved from the current location to below (a) which makes it clear that Statement: the exceptions refer to 215.2(A)(1)(a).

A new Exception 2 is also added to this first revision that allows for intermediate feeder segments.
that are only limited by the ampacity parameters that apply over the length of the run and that do not involve usual termination limitations. This type of provision is technically appropriate and had been done in the past, but has been inadvertently prohibited due to the recent restructuring of the usual requirements. The exception also includes language excluding feeder segments that use this allowance from entering the source and destination enclosures. In this way the exception precludes the installation of the conductor length calculated under normal procedures that would otherwise evade the equipment termination requirements of the rule under the exception.

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

Due to the placement of the exceptions, a very literal reading of the Code could imply that the user does not have to consider ampacity adjustment or temperature correction factors when using the exceptions. By placing the reference to item "(a)" in the Exception title, it is clear that they are exceptions to the requirement found in item (a).

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

This PI does two things. First, it relocates the exceptions now following the end of 215.2(A)(1) so they will follow (a) only. They are not exceptions to the requirement that wires must be able to handle the load, a rule for the middle of a wire, they are exceptions to the heat sinking provisions at terminations, the rule in (a) covering the ends of a wire. The second topic is addressed in an additional exception, presented here as Ex. 2. This result is strongly implied by 110.14(C)(2) and by physics, but it now directly conflicts with the literal text of 215.2(A)(1)(a). The existing wording of 215.2(A)(1) is perfectly correct for the usual case where a monolithic feeder is laid out based on the worst case of either the effects of mutual conductor heating and ambient temperatures on the wiring, or the requirement to provide a heat sink for connected devices to accommodate continuous loading. Given soaring copper costs, however, for some very large and long feeders it becomes cost effective to place pull boxes at both ends of the run and reduce the size to that governed by ampacity considerations alone. The procedure is to leave and arrive at overcurrent devices with conductors sized to accommodate the effects of continuous loading on those devices. Then the intervening run is sized in accordance with the ampacity requirements for the conductor as defined in Article 100, specifically to provide wiring that will accommodate the maximum current in amperes, whether or not any portion of that current is continuous, that will not exceed its temperature rating under the conditions of use. By relocating the exceptions, this PI avoids potential confusion by leaving (b) at the end, unmolested by exceptions. CMP 2 agreed to this concept when it incorporated the current Exception No. 2 (will become No. 3), which allows for grounded conductors to use this procedure provided they don’t arrive at or depart from an overcurrent device. The same logic supports this proposal. Splicing devices rated for full conductor temperatures are readily available and clearly permitted in the middle of runs by 110.14(C)(2) and including busbar terminations generally. This proposal makes the implied result clear and more capable of understanding. The reason for placing the new text as the second exception is editorial and would result in the grouping of what would now be two exceptions that generally focus on ungrounded conductors. CMP 2 also accepted this concept in the proposal stage for the 2014 cycle. It was subsequently rejected based on Comment 2-94. That comment fully supported the concept and opined that the NEC allowed the practice. That was arguably the case in the 2011 NEC (which was in effect when Comment 2-94 would have been written), but is clearly not the case now, because CMP 2 rewrote 215.2(A)(1) for the 2014 cycle. Now feeders, over their entire length, must satisfy both the requirements for the device terminations in (a) and the requirements that apply over the length of the feeder in (b). This exercise was a valuable simplification and is fully appropriate for the vast majority of installations where no step up or step down in wire sizing occurs. However, the NEC, inadvertently, now plainly prohibits a procedure that Comment 2-94 ironically supported in its substantiation. This is not a theoretical abstraction. This submitter was consultant to an electrical contractor who ran three parallel runs of custom 500 kcmil THHN Type MC cable [with oversized equipment grounding conductors to meet 250.122(F)] between pull boxes about 300 feet apart as the major portion of a 1200A feeder. The pull boxes contained separate wire splicing devices pursuant to 114.14(C)(2) that
enabled 600 kcmil tails to land in the originating and destination switchgear and thereby meet 110.14(C)(1)(b). The inspector rejected the installation, based on prior code wording in effect at the time that could be read in either direction; the same inspection today would necessarily go the same way because all ambiguity has been removed. Needless to say, replacing the intervening cabling with custom 600 kcmil THHN Type MC cable was a hideous expense that accomplished exactly nothing in terms of any marginal improvement in safety. There is absolutely no technical justification to support the result in such cases, only literal text with much to commend it editorially, but badly in need of a way out in these circumstances. Procedural Note: What is now (b) is showing in the TerraView text as a second (a), together with underlined text that is not, in fact, being changed. That is due to a known bug in the software, and cannot be corrected by the submitter. To be clear, this submittal calls for (a) as currently written, followed by three exceptions, followed by (b) as currently written.
625.40   Electric Vehicle Branch Circuit.
Each outlet installed for the purpose of charging electric vehicles shall be supplied by an individual branch circuit. Each circuit shall have no other outlets.

Committee Statement

Committee Statement: This is a relocation of an existing requirement from 210.17, and is believed to be needed to be located within Article 625 to form a conceptual whole. The addition of this section is contingent on the response to PI 3601 and the deletion of Section 210.17.

Response Message:
This input is a companion to one in Article 210 to delete 210.17 and relocate its provisions to this article as a Chapter 6 supplementation and modification to Chapter 2. The editorial renumbering inserts this provision as the first section in Part III. The dedicated circuit rule should be here to form a conceptual whole, and positioned first so the next section is the overcurrent protection for the circuit, then followed by the equipment rating and disconnecting provisions at the equipment.
110.11 Deteriorating Agents.

Unless identified for use in the operating environment, no conductors or equipment shall be located in damp or wet locations; where exposed to gases, fumes, vapors, liquids, or other agents that have a deteriorating effect on the conductors or equipment; or where exposed to excessive temperatures.

Informational Note No. 1: See 300.6 for protection against corrosion.

Informational Note No. 2: Some cleaning and lubricating compounds can cause severe deterioration of many plastic materials used for insulating and structural applications in equipment.

Equipment not identified for outdoor use and equipment identified only for indoor use, such as "dry locations," "indoor use only," "damp locations," or enclosure Types 1, 2, 5, 12, 12K, and/or 13, shall be protected against damage from the weather during construction.

Informational Note No. 3: See Table 110.28 for appropriate enclosure-type designations.

Informational Note No. 4: Minimum flood provisions are provided in NFPA 5000 -2015 Building Construction and Safety Code, the International Building Code (IBC), and the International Residential Code for One- and Two-Family Dwellings (IRC).

Committee Statement

Committee Statement: The new Informational note No. 4 refers users to other codes that contain provisions dealing with areas subject to floods, which can be mandatory requirements.
210.17  Guest Rooms and Guest Suites.

Guest rooms and guest suites that are provided with permanent provisions for cooking shall have branch circuits installed to meet the rules for dwelling units.

210.18  Rating.

Branch circuits recognized by this article shall be rated in accordance with the maximum permitted ampere rating or setting of the overcurrent device. The rating for other than individual branch circuits shall be 15, 20, 30, 40, and 50 amperes. Where conductors of higher ampacity are used for any reason, the ampere rating or setting of the specified overcurrent device shall determine the circuit rating.

Exception: Multioutlet branch circuits greater than 50 amperes shall be permitted to supply nonlighting outlet loads on industrial premises where conditions of maintenance and supervision ensure that only qualified persons service the equipment.

Committee Statement

Committee  Relocate all of Section 210.3 to the first section of Part II. Branch circuit ratings are more appropriately located in Part II which is Titled Branch Circuit ratings. This change will allow for 210.3 to be open to a section "Other Articles" similar to Sections xxx.3 in other Articles. This relocated section would be renumbered 210.18. Relocate Section 210.18 to 210.17 since Section 210.17 was deleted.
110.9 Interrupting Rating.

Equipment intended to interrupt current at fault levels shall have an interrupting rating at nominal circuit voltage sufficient for at least equal to the current that is available at the line terminals of the equipment.

Equipment intended to interrupt current at other than fault levels shall have an interrupting rating at nominal circuit voltage sufficient for at least equal to the current that must be interrupted.

Committee Statement

Committee Statement: This section is editorially revised to replace the words “sufficient for” with the phrase “at least equal to” in two locations. The revision provides improved clarity in the general requirement of this section in addition to aligning with the NEC Style Manual regarding use of vague words and terms.

Statement of Problem and Substantiation for Public Input

Table 3.2.1 of the NEC Style Manual states that the word “sufficient” can be considered to be vague and unenforceable and should be reviewed in context to determine if the use of the word becomes unenforceable. The use of the word “sufficient” in 110.9 does not indicate that the interrupting rating must be equal to the current that must be interrupted, whereas the words “at least equal to the current” provides clear text for the enforcement of this requirement.
110.5 Conductors.

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

Informational Note: For aluminum and copper-clad aluminum conductors, see 310.15.

Committee Statement

Committee: Revisions to the text in 110.5 provide clarity and usability of this section regarding use of copper and aluminum conductors as provided throughout the NEC. The word aluminum is removed from the informational note because it is now included in the text of this section.

1. Statement of Problem and Substantiation for Public Input

The NEC code-making panels have done an excellent job throughout the Code of specifying instances where a particular metal is required in a particular installation. We no longer need a blanket statement such as the existing 110.5 (which is now being misinterpreted by some); rather, the suggested language in 110.5 would provide guidance if there is some reference in the NEC that is unclear, without creating confusion in cases where other metals are allowed.

2. Statement of Problem and Substantiation for Public Input

The requirement that all conductors be copper is not needed, and can create confusion. I found myself in a debate with a Code expert that has served on Code Making Panels for over thirty year on this subject. He believed that, because 547.5(F) requires a copper conductor (even though the 2014 Code removed that requirement) because it doesn't specify the material. In his opinion, citing 110.5 as justification, mandates a copper conductor for every portion of every installation unless the Code specifically states that aluminum can be used. 90.3 tells us that the EGC in question can be aluminum, because 250.118 allows for an aluminum conductor, and 547 doesn't supplement or modify that allowance. The first sentence of 110.5 isn't necessary and only results in confusion, even among experts of the Code.
First Revision No. 40-NFPA 70-2015 [New Section after 110.14(C)]

(D) Installation.
Where a tightening torque is indicated as a numeric value on equipment or in installation instructions provided by the manufacturer, a calibrated torque tool shall be used to achieve the indicated torque value, unless the equipment manufacturer has provided installation instructions for an alternative method of achieving the required torque.

Committee Statement

Committee Use of proper torque tools is essential to verify that terminations are properly made and the equipment will function properly throughout its life cycle. Testing has shown that installers use the wrong torque values in up to 75% of installations unless a torque measuring tool is used.

Statement of Problem and Substantiation for Public Input
Many electricians use non-torqueing tools to terminate conductors on set-screw connectors in equipment. Findings of a field study presented to CMP-1 during the 2011 cycle to substantiate Annex I, and articles published in IAEI News and EC&M showed that electricians incorrectly tighten these terminations at least 75 percent of the time when not using a torque wrench. Since the reliability and safety of terminations depends on proper connection, it is essential to require the use of the proper tool. This language would make it clear to installers that using torque tools is required when a torque value is indicated on the equipment.

Public Input No. 1323-NFPA 70-2014 [New Section after 110.14(C)]

Affirmative with Comment
Sood, Mohinder P.
This may be an enforcement issue for the AHJs as when inspectors go for inspections an electrician may or may not be present at the job site. Even when they have the proper tool, inspectors are not going to be present when actual work is being done (early morning, late night etc.). It will be the same issue when preventive maintenance is performed on the switchgear in large buildings.

X

Negative with Comment
Barrios, Louis A.
This change has the potential of having a significant impact on the electrical industry. Emphasis and priority should be given to properly torquing bolted connections before implementing mandatory requirements for smaller gauge wire and connections on terminal strips.
Because of different characteristics of dissimilar metals, devices such as pressure terminal or pressure splicing connectors and soldering lugs shall be identified for the material of the conductor and shall be properly installed and used. Conductors of dissimilar metals shall not be intermixed in a terminal or splicing connector where physical contact occurs between dissimilar conductors (such as copper and aluminum, copper and copper-clad aluminum, or aluminum and copper-clad aluminum), unless the device is identified for the purpose and conditions of use. Materials such as solder, fluxes, inhibitors, and compounds, where employed, shall be suitable for the use and shall be of a type that will not adversely affect the conductors, installation, or equipment.

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

Informational Note: Many terminations and equipment are either marked with tightening torque or are identified as to tightening torque in the installation instructions provided.

### Committee Statement

**Committee** The addition of new 110.14(D) in FR 40 eliminates the need for the informational note in 110.14.

**Statement:** 110.14.

**Response Message:**

### Statement of Problem and Substantiation for Public Input

This proposal aligns with the NEMA proposal to add new 110.14(D), where the substance of the informational note in 110.14 is incorporated in new 110.14(D).
422.30 General.

A means shall be provided to simultaneously disconnect each appliance from all ungrounded conductors in accordance with the following sections of Part III. If an appliance is supplied by more than one branch-circuit or feeder, these disconnecting means shall be grouped and identified as being the multiple disconnecting means for the appliance. Each disconnecting means shall simultaneously disconnect all ungrounded conductors that it controls.

Committee Statement

Committee Statement: This revision deletes a clause made redundant by relocation (and revision) to 422.5 in FR 1.

Response Message:

Statement of Problem and Substantiation for Public Input

If you have more than one disconnecting means for an appliance and these disconnecting means are located in different (separate) enclosures, is it physically possible to achieve “simultaneous” disconnection? If you had two separate disconnects and a person is very coordinated, can he or she “simultaneously” disconnect both disconnects using both hands at the same time? What if we have three or four separate disconnects? Can myself and a friend get these multiple disconnects “simultaneously” disconnected at the same time? I suspect greatly that the reason for this “simultaneous” disconnecting requirement is to try and prevent someone from turning off one of two disconnects to an appliance and incorrectly think all sources of power have been removed from the appliance. This public input would go a step further and require identification of the presence of multiple disconnecting means. The last sentence would give some measure of compliance with the “simultaneously” disconnect requirement. The text suggested is text similar to existing text in the NEC such as 230.74.

Related Public Comments for This Document

Affirmative with Comment
Cook, Donald R.
While IAEI supports action in FR 4811, the committee statement does not correlate with the action. This revision correlates with several of FR's related to appliances with more than one supply. This revision is not related to 422.5 or FR 1.

Negative with Comment
Querry, Dennis Michael
The current proposed wording is confusing: Current proposed text: 422.30 General. A means shall be provided to simultaneously disconnect each appliance from all ungrounded conductors...
in accordance with the following sections of Part III. If an appliance is supplied by more than
one branch circuit or feeder, these disconnecting means shall be grouped and identified as
being the multiple disconnecting means for the appliance. Each disconnecting means shall
simultaneously disconnect all ungrounded conductors that it controls. Suggested
rewording: 422.30 General. A means shall be provided to simultaneously disconnect each
appliance from all ungrounded conductors in accordance with the following sections of Part III.
If an appliance is supplied by more than one branch circuit or feeder, these disconnecting
means shall be grouped. Each disconnect shall be identified as one of multiple disconnects for
the appliance. Each disconnecting means shall simultaneously disconnect all ungrounded
conductors that it controls.
(A) Rated at Not over 300 Volt-Amperes or 1/8 Horsepower.

For permanently connected appliances rated at not over 300 volt-amperes or 1/8 hp, the branch-circuit overcurrent device shall be permitted to serve as the disconnecting means where the switch or circuit breaker is within sight from the appliance or is lockable in accordance with 110.25.

Committee Statement

Committee Statement: The disconnecting means needs to be within sight from the appliance or be lockable. The panel edited requirement for consistency with 422.31(B) as the potential risk of electric shock would be the same for both circumstances.

Response Message:

Statement of Problem and Substantiation for Public Input

Consider a dishwasher. If it is hardwired, or the outlet for a plug-in device is not accessible, then the 422.33 sends you to 422.31. This revision would allow all small appliances to use the breaker as the disconnecting means but only if a lock is present to ensure the safety of the service personnel.

Negative with Comment

Querry, Dennis Michael

The NEC does not define permanently connect appliances however article 220.53 does somewhat define appliance fastened in place. Suggested rewording: (A) Appliances fastened in place rated at not over 300 Volt-Amperes or motor operated appliances not over 1/8 Horsepower. For permanently connected appliances fastened in place rated at not over 300 volt-amperes or motor operated appliances not over 1/8 hp, the branch-circuit overcurrent device shall be permitted to serve as the disconnecting means where the switch or circuit breaker is within sight from the appliance or is lockable in accordance with 110.25.
Means shall be provided to simultaneously disconnect the heater, motor controller(s), and supplementary overcurrent protective device(s) of all fixed electric space-heating equipment from all ungrounded conductors. Where heating equipment is supplied by more than one source, feeder, or branch circuit, the disconnecting means shall be grouped and marked identified as having multiple disconnecting means. Each disconnecting means shall simultaneously disconnect all ungrounded conductors that it controls. The disconnecting means specified in 424.19(A) and (B) shall have an ampere rating not less than 125 percent of the total load of the motors and the heaters and shall be lockable in accordance with 110.25.

Committee Statement

Committee Statement: The panel change the text to provide identification for multiple disconnecting means.

Response Message:

Statement of Problem and Substantiation for Public Input

Based on the Article 100 definitions for service conductors, feeder, and branch circuit, the supply to any heating equipment (source) would always be a branch circuit or possibly a feeder. The term “source” adds nothing to this requirement.

Statement of Problem and Substantiation for Public Input

If you have more than one disconnecting means for fixed electric space-heating equipment and these disconnecting means are located in different (separate) enclosures, is it physically possible to achieve “simultaneous” disconnection? If you had two separate disconnects and a person is very coordinated, can he or she “simultaneously” disconnect both disconnects using both hands at the same time? What if we have three or four separate disconnects? Can myself and a friend get these multiple disconnects “simultaneously” disconnected at the same time? I suspect greatly that the reason for this “simultaneous” disconnecting requirement is to try and prevent someone from turning off one of two disconnects to the heating equipment and incorrectly think all sources of power have been removed from the equipment. This public input would go a step further and require identification of the presence of multiple disconnecting means. The next to last sentence (added sentence) would give some measure of compliance with the “simultaneously” disconnect requirement. The text suggested is text similar to existing text in the NEC such as 230.74.

Negative with Comment

Querry, Dennis Michael

Current proposed text: Means shall be provided to simultaneously disconnect the heater, motor controller(s), and supplementary overcurrent protective device(s) of all fixed electric space-heating equipment from ungrounded conductors. Where heating equipment is supplied by more than one source, feeder, or branch circuit, the disconnecting means shall be grouped and identified as having multiple disconnecting means. Each disconnecting means shall simultaneously disconnect all ungrounded conductors that it controls. The disconnecting means specified in 424.19(A) and (B) shall have an ampere rating not less than 125 percent of the total load of the motors and the heaters and shall be lockable in accordance with 110.25.

Suggested rewording: Means shall be provided to simultaneously disconnect the heater, motor controller(s), and supplementary overcurrent protective device(s) of all fixed electric space-
heating equipment from all ungrounded conductors. Where heating equipment is supplied by
more than one source, feeder, or branch circuit, the disconnecting means shall be grouped.
Each disconnect shall be identified as one of the multiple disconnects for the equipment. Each
disconnecting means shall simultaneously disconnect all ungrounded conductors that it
controls. The disconnecting means specified in 424.19(A) and (B) shall have an ampere rating
not less than 125 percent of the total load of the motors and the heaters and shall be lockable
in accordance with 110.25.
### 424.44 Installation of Cables in Concrete or Poured Masonry Floors.

- **(A) Watts per Linear Meter (Foot).**
  
  Constant wattage heating cables shall not exceed 54 watts per linear meter (16.41\(\frac{1}{2}\) watts per linear foot) of cable.

- **(A) Spacing Between Adjacent Runs.**
  
  The spacing between adjacent heating cable shall not be less than 25 mm (1 in.) on centers be installed in accordance with the manufacturer's instructions.

- **(B) Secured in Place.**
  
  Cables shall be secured in place by nonmetallic frames or spreaders or other approved means while the concrete or other finish is applied.

- **(C) Spacing Between Heating Cable and Metal Embedded in the Floor.**
  
  Spacing shall be maintained between the heating cable and metal embedded in the floor, unless the cable is a grounded metal-clad cable.

- **(C) Leads Protected.**
  
  Leads shall be protected where they leave the floor by rigid metal conduit, intermediate metal conduit, rigid nonmetallic conduit, electrical metallic tubing, or by other approved means.

- **(D) Bushings or Approved Fittings.**
  
  Bushings or approved fittings shall be used where the leads emerge within the floor slab.

- **(E) Ground-Fault Circuit-Interrupter Protection.**
  
  Ground-fault circuit-interrupter protection for personnel shall be provided for cables installed in electrically heated floors of bathrooms, and kitchens, and in hydromassage bathtub locations.

### Committee Statement

**Committee Statement**: The revision eliminates prescriptive installation criteria that do not take into account the heating cable design. The intended installation criteria are required by the product safety standard to be specified in the manufacturer’s instructions for the heating cable. These instructions are addressed as a part of the heating cable listing and labeling (424.6).

Item (D) has been deleted because cable is required to be listed which requires a grounding component (braid or sheath) over the heated section of the cable. There were no such standards when this requirement was first introduced into the code.

### Statement of Problem and Substantiation for Public Input

This proposal is submitted by and represents the consensus of the Article 424 Electric Space Heating Working Group. This group was formed as an outcome of an industry Standards
Technical Panel (STP) meeting for Electric Radiant Heating Panels and Cables (which covers UL Standards for these products). The members on this Art 424 working group are a subset of the interested parties from the electric space heating industry, and this NFPA 70 code change proposal in not intended to speak on behalf of the UL STP nor any of its individual members. The members and affiliations of the Article 424 Electric Space Heating Working Group are as follows: Dustin Allcorn, Watts Radian, Julia Billen, WarmlyYours.com Inc., Tony De Francesco, Aeromation Inc., Monica Irgens, Electro Plastics Inc., Steven Kuscsik, UL LLC, Tim Lassila, UL LLC, Kurt Neuswanger, OJ Electronics Inc., Pete Pretorius, Nuheat Industries Ltd., Sam Sampson, Department of Labor & Industry, Minnesota, Jonathan Willner, Heatronix.

The product designs are non-standardized and vary from manufacturer, in the watt density, spacings, and method of securement. We feel that wattage rating and cable to cable spacing requirements should be based on the product’s performances which are addressed by the product safety standard. The product safety standard contains requirements for testing a product per the manufactures installation requirements and address temperature concerns. Also, because the installation of these products is not standardized, the manufacturers are required under the Listing to provide detailed installation instructions that specify the wattage ratings, how the products are to be spaced. There are several factors that affect how hot a product or surface temperature reached and evaluated under the product’s listing evaluation.

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

Substantiation: It is unclear to me what is required to be grounded. If it is the sheath, then I suggest a change to the text. If something else is to be grounded, then perhaps other text is required.

X

**Affirmative with Comment**

Cook, Donald R.

IAEI generally supports action in FR 4833, but new item ( C ) indicates leads shall be protected by one of several prescriptive wiring methods or other approved means. The requirement provides no basis for that "other approved" means. Item (D) requires bushings or other approved fittings to be provided where leads emerge within the floor slab. The requirement provides no basis for that "approved fitting". An NEC requirement should not expect or permit approval an with no basis for the AHJ to provide that approval. Text should provide clarification for existing phrase "emerge within the floor slab" in item (D).
First Revision No. 4872-NFPA 70-2015 [ Section No. 424.3(A) ]

<table>
<thead>
<tr>
<th>(A) Branch-Circuit Requirements.</th>
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<tbody>
<tr>
<td>Individual branch circuits shall be permitted to supply any volt-ampere or wattage rating of fixed electric space-heating equipment for which they are rated.</td>
</tr>
<tr>
<td>Branch circuits supplying two or more outlets for fixed electric space-heating equipment shall be rated 15, 20, 25, or not over 30 amperes. In other than a dwelling unit, fixed infrared heating equipment shall be permitted to be supplied from branch circuits rated not over 50 amperes.</td>
</tr>
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</table>

Committee Statement

Committee: The revision enables future branch circuit sizes up to 30 amps that may be permitted in 210.3.

Statement of Problem and Substantiation for Public Input

As discussed voltages and ampacities must match for the 1000v equipment down to a #18cu/#17 wire with the outlet.
Electrically Operated In-Sink Waste Disposers.

Electrically operated in-sink waste disposers shall be permitted to be cord-and-plug-connected with a flexible cord identified as suitable in the installation instructions of the appliance manufacturer where all of the following conditions are met:

1. The flexible cord shall be terminated with a grounding-type attachment plug.

   **Exception:** A listed in-sink waste disposer distinctly marked to identify it as protected by a system of double insulation, or its equivalent, shall not be required to be terminated with a grounding-type attachment plug.

2. The length of the cord shall not be less than 450 mm (18 in.) and not over 900 mm (36 in.).

3. Receptacles shall be located to avoid protect against physical damage to the flexible cord.

4. The receptacle shall be accessible.

**Committee Statement**

*Committee Statement:* This revision is part of the panel's intent to use consistent language across the article. "Protects against" more accurately describes the protection.

*Response Message:*

**Affirmative with Comment**

Blewitt, Thomas V.

In the context of a sink waste disposer, it is unclear in the exception what the equivalent to double insulation is. Since these appliances may either be protected by grounding or double insulation, the "or its equivalent" statement in the requirement could be deleted without affecting product design and to also avoid confusion.

**Negative with Comment**

Querry, Dennis Michael

The current proposed text implies that the receptacle will protect the flexible cord: Current text: Receptacles shall be located to protect against physical damage to the flexible cord.

Suggested rewording: Receptacles shall be located such that the associated flexible cord will be protected from physical damage.
(1) Paralleled Installations:

Conductors shall be permitted to be run in parallel in accordance with the provisions of 310.10(H). The requirement to run all circuit conductors within the same raceway, auxiliary gutter, cable tray, trench, cable, or cord shall apply separately to each portion of the paralleled installation, and the equipment grounding conductors shall comply with the provisions of 250.122. Parallel runs in cable tray shall comply with the provisions of 392.20(C).

Exception: Conductors installed in nonmetallic raceways run underground shall be permitted to be arranged as isolated phase, neutral, and grounded conductor installations. The raceways shall be installed in close proximity, and the isolated phase, neutral, and grounded conductors shall comply with the provisions of 300.20(B).

Committee Statement

Committee Statement: The addition of “neutral and grounded” conductors in two places within the exception does provide clarity that ungrounded, grounded, and neutral conductors are included in the isolation permitted within the exception. Based on PI 3271, the addition of “polarity” conductors, as submitted in the PI is unnecessary since induction is not an issue with dc conductors installed in separate raceways. The reference to 250.24(C)(2) is unnecessary since the sizing requirement is already covered by Article 250 where individual raceways are installed.

Response

Message:

Public Input No. 3271-NFPA 70-2014 [Section No. 300.3(B)(1)]

This new text will update this section to include DC systems and make clear the Neutral may also be isolated. which is common in underground electrical duct banks.

Affirmative with Comment

Brewer, Larry G.

I agree with the statements of the committee.
300.3(B)(4)

(4) Column-Width Panelboard Enclosures.

Where an auxiliary gutter runs between a column-width panelboard and a pull box, and the pull box includes neutral terminations, the neutral conductors of circuits supplied from the panelboard shall be permitted to originate in the pull box.

Committee Statement

Committee Statement: The addition of Panelboard to the title of this subsection, based on PI 1237 and 4542, provides further clarification by adding "Column-width" located in the title before Panelboard indicating this requirement only applies to a column-width panelboard. This clarification will make it easier to address Column-width Panelboards in the index since this is the only location in the NEC where the issue of a column-width panelboard is addressed.

Response Message:

Statement of Problem and Substantiation for Public Input

Since Enclosure can mean many types, See definition. The code section only deals with panelboards. The title should be specific to the requirement.
(F) Backfill.

Backfill that contains large rocks, paving materials, cinders, large or sharply angular substances, or corrosive material shall not be placed in an excavation where materials may damage raceways, cables, conductors, or other substructures or prevent adequate compaction of fill or contribute to corrosion of raceways, cables, or other substructures.

Where necessary to prevent physical damage to the raceway or cable, protection shall be provided in the form of granular or selected material, suitable running boards, suitable sleeves, or other approved means.

Committee Statement

**Committee Statement:** Conductors has been added to the requirement for protection of raceways and cables in 300.5(F) since Table 300.5 Column 1 recognizes both directly buried cables and directly buried conductors. This change will provide protection for raceway, cable and conductor directly buried installations.

**Response Message:**

**Statement of Problem and Substantiation for Public Input**
The present wording literally does not require this type of protection for conductors. I believe the intent of this section is to require the same type of protection for conductors as well as cables, and raceways too.
### Raceway Seals

Conduits or raceways through which moisture may contact live parts shall be sealed or plugged at either or both ends. Spare or unused raceways shall also be sealed. Sealants shall be identified for use with the cable insulation, conductor insulation, bare conductor, shield, or other components.

Informational Note: Presence of hazardous gases or vapors may also necessitate sealing of underground conduits or raceways entering buildings.

### Committee Statement

Committee Statement: This new text is the same as used in 225.27, covering raceway seals for outside feeder and branch circuits, and similar to that of 230.8, covering raceway seals for service raceways. Any sealant used to seal a raceway containing conductors should not cause damage to cable insulation, the conductor, or any component of the cable.

Response Message:

Statement of Problem and Substantiation for Public Input

Substantiation- Proposed language is the same in section 225.27 Raceway Seal, and similar to that of 230.8 Raceway Seal. Proposal 4-35 added the language requiring sealing of raceways in the 2011 NEC, and was modified slightly in the 2014 NEC by proposal 4-38. This proposal will align the language in 225.27 Raceway Seal, 300.5(G) Raceway Seals and 230.8 Raceway Seal, making the code more user friendly.

Statement of Problem and Substantiation for Public Input

Put all the low voltage sealing in one place.

Statement of Problem and Substantiation for Public Input

Provides needed consistency and correlation with other requirements in the code. Examples of raceway seal requirements can be found in Art. 230.8 and 225.27. This requirement for a raceway seal should be the same at each location in the code.

Negative with Comment

Mills, T. David

The word “identified” should be replaced with the word “approved”. Many sealants that are commonly used for this purpose are not identified as that term is defined in Article 100. There does not appear to be a UL standard that these products can be evaluated to regarding possible effects on conductors and their insulation. The AHJ should have the ability to approve sealants that have been used for many years without evidence of a problem. It is recommended that this word change from “identified” to “approved” be considered by CMP-4 in sections 225.27 and 230.8.
(J) Earth Movement.

Where direct-buried conductors, raceways, or cables are subject to movement by settlement or frost, direct-buried conductors, raceways, or cables shall be arranged so as to prevent damage to the enclosed conductors or to equipment connected to the raceways.

Informational Note: This section recognizes "S" loops in underground direct burial cables and conductors to raceway transitions, expansion fittings in raceway risers to fixed equipment, and, generally, the provision of flexible connections to equipment subject to settlement or frost heaves.

Committee Statement

Committee Statement: The text in this Informational Note was inserted in the 1996 NEC and has remained unchanged since it was submitted. Electricians understand that an "S" loop is installed in directly buried cables or conductors to ensure that expansion and contraction can occur in these directly buried conductors and cables. "Cables and conductors" were inserted to clarify that the directly buried cables and conductors may be formed into "S" loops.

Response Message:

Statement of Problem and Substantiation for Public Input

"S" loops is an undefined term. One can assume that "S" loops are nothing but flexible conductors, raceways or cables.
### 300.12 Mechanical Continuity — Raceways and Cables.

**Metal or nonmetallic raceways** Raceways, cable armors, and cable sheaths shall be continuous between cabinets, boxes, fittings, or other enclosures or outlets.

**Exception No. 1:** Short sections of raceways used to provide support or protection of cable assemblies from physical damage shall not be required to be mechanically continuous.

**Exception No. 2:** Raceways and cables installed into the bottom of open bottom equipment, such as switchboards, motor control centers, and floor or pad-mounted transformers, shall not be required to be mechanically secured to the equipment.

### Committee Statement

Committee: The phrase "Metal or nonmetallic" has been removed since the use of the terms, "metal" and "nonmetallic" cover all raceways anyway.

Response:  
Message:  

### Statement of Problem and Substantiation for Public Input

"metal or nonmetallic" is meaningless as it means everything. It is the same as saying "blue and not blue"
725.1 Scope.

This article covers remote-control, signaling, and power-limited circuits that are not an integral part of a device or appliance of utilization equipment.

Informational Note: The circuits described herein are characterized by usage and electrical power limitations that differentiate them from electric light and power circuits; therefore, alternative requirements to those of Chapters 1 through 4 are given with regard to minimum wire sizes, ampacity adjustment and correction factors, overcurrent protection, insulation requirements, and wiring methods and materials.

Committee Statement

Committee Statement: Changing “appliance” to “utilization equipment” more closely matches the definitions in Article 100. The other changes proposed by the submitter do not add clarity to the Scope of Article 725.

Response Message:

Statement of Problem and Substantiation for Public Input

Statement of Problem and Substantial for Proposal. Utilization equipment covered by Articles 393, 411 and 600 reference rules in Article 725, notwithstanding 725 does not include power limited circuits in utilization equipment within its scope. This conflict creates confusion because rules that were not intended to apply to utilization equipment are made applicable by reference from other Code articles. Also confusing is the lack of recognizable rules associated with the specific utilization equipment required to comply with 725 rules. A comprehensive solution to this Code issue is to address the paradigm shift that has progressively taken place with regard to Article 725 and its application to the ever-expanding use of low voltage limited energy circuits within utilization equipment. There is general agreement that Article 725 is the principal Code source for field wiring of low-voltage, limited energy, Class 2 secondary circuits. This is confirmed by references from other Code articles covering utilization equipment containing limited energy circuits. Furthermore, Article 725 also serves as a basis for UL Standards for limited energy utilization equipment, e.g. signs. CLASS 2 SUPPLY SOURCE – An electrical source such as a transformer, power supply, or battery having an open-circuit voltage that is less than 30 Vrms (42.4 Vpeak) or 60 Vdc and having limited energy available in the circuit under load conditions, including short circuit and extremely low resistance as specified by the current and VA limitations of the Article 725 of the National Electrical Code, NFPA 70. [UL 48.2.11] Class 2 wiring methods in accordance with 300, 600.12(C)(1)(2), 600.33, and 725 of the National Electrical Code, ANSI/NFPA 70, shall be used for wiring between the LED unit and remote power units marked Class 2 or LPS. [UL 879A] Even though utilization equipment is excluded from the scope of 725, since 2005, Articles 411 and 600 have incorporated references to Article 725 rules for low-voltage luminaries and low energy, Class 2 sign illumination system wiring. [2005 NEC® 411.4(A)(2), 600.24] [2011 NEC®600.12, 600.33] Additionally, Article 393 was been added to the 2014 Code for Low Voltage Suspended Ceiling Power Distribution Systems which includes 725 requirements [393.6(b)(4), 393.14(b)(1)] The paradigm shift over the last four code cycles recognizes that Article 725 rules are applicable to low voltage, energy limited circuits of other than remote-control and signaling circuits. Adding utilization equipment and the limited energy circuits to the Scope of 725 will abate the continuing conflict presented by the exclusion of utilization equipment.
Class 2, Class 3, and PLTC cables shall comply with any of the requirements described in 725.154(A) through (C) and as indicated in Table 725.154.

### Table 725.154 Applications of Listed Class 2, Class 3, CMUC, and PLTC Cables in Buildings

<table>
<thead>
<tr>
<th>Applications</th>
<th>Wire and Cable Type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CL2 &amp; CL3P</td>
</tr>
<tr>
<td>In fabricated ducts as described in 300.22(B)</td>
<td>Y*</td>
</tr>
<tr>
<td>In metal raceway that complies with 300.22(B)</td>
<td>Y*</td>
</tr>
<tr>
<td>In other spaces used for environmental air as described in 300.22(C)</td>
<td>Y*</td>
</tr>
<tr>
<td>In metal raceway that complies with 300.22(C)</td>
<td>Y*</td>
</tr>
<tr>
<td>In plenum communications raceways</td>
<td>Y*</td>
</tr>
<tr>
<td>In plenum cable routing assemblies</td>
<td>NOT PERMITTED</td>
</tr>
<tr>
<td>Supported by open metal cable trays</td>
<td>Y*</td>
</tr>
<tr>
<td>Supported by solid bottom metal cable trays with solid metal covers</td>
<td>Y*</td>
</tr>
<tr>
<td>In vertical runs</td>
<td>Y*</td>
</tr>
<tr>
<td>In metal raceways</td>
<td>Y*</td>
</tr>
<tr>
<td>In fireproof shafts</td>
<td>Y*</td>
</tr>
<tr>
<td>In plenum communications raceways</td>
<td>Y*</td>
</tr>
<tr>
<td>In plenum cable routing assemblies</td>
<td>Y*</td>
</tr>
<tr>
<td>In riser communications raceways</td>
<td>Y*</td>
</tr>
<tr>
<td>In riser cable routing assemblies</td>
<td>Y*</td>
</tr>
<tr>
<td>In one- and two-family dwellings</td>
<td>Y*</td>
</tr>
<tr>
<td>Within buildings in other than air-handling spaces and risers</td>
<td>General</td>
</tr>
<tr>
<td></td>
<td>Y*</td>
</tr>
<tr>
<td>In one- and two-family dwellings</td>
<td>Y*</td>
</tr>
<tr>
<td>In multifamily dwellings</td>
<td>Y*</td>
</tr>
<tr>
<td>In nonconcealed spaces</td>
<td>Y*</td>
</tr>
<tr>
<td>Supported by cable trays</td>
<td>Y*</td>
</tr>
<tr>
<td>Under carpet</td>
<td>N</td>
</tr>
<tr>
<td>In cross-connect arrays</td>
<td>Y*</td>
</tr>
<tr>
<td>In any raceway recognized in</td>
<td>Y*</td>
</tr>
</tbody>
</table>
**Wire and Cable Type Applications**

<table>
<thead>
<tr>
<th>Applications</th>
<th>CL2P &amp; CL3P</th>
<th>CL2R &amp; CL3R</th>
<th>CL2X &amp; CL3X</th>
<th>CMUC</th>
<th>PLTC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 3</td>
<td>Y*</td>
<td>Y*</td>
<td>N</td>
<td>N</td>
<td>Y*</td>
</tr>
<tr>
<td>In plenum communications raceways</td>
<td>Y*</td>
<td>Y*</td>
<td>N</td>
<td>N</td>
<td>Y*</td>
</tr>
<tr>
<td>In plenum cable routing assemblies</td>
<td>Y*</td>
<td>Y*</td>
<td>N</td>
<td>N</td>
<td>Y*</td>
</tr>
<tr>
<td>In riser communications raceways</td>
<td>Y*</td>
<td>Y*</td>
<td>N</td>
<td>N</td>
<td>Y*</td>
</tr>
<tr>
<td>In riser cable routing assemblies</td>
<td>Y*</td>
<td>Y*</td>
<td>N</td>
<td>N</td>
<td>Y*</td>
</tr>
<tr>
<td>In general-purpose communications raceways</td>
<td>Y*</td>
<td>Y*</td>
<td>N</td>
<td>N</td>
<td>Y*</td>
</tr>
<tr>
<td>In general-purpose cable routing assemblies</td>
<td>Y*</td>
<td>Y*</td>
<td>N</td>
<td>N</td>
<td>Y*</td>
</tr>
</tbody>
</table>

**Note:** An “N” in the table “N” indicates that the cable type shall not be permitted to be installed in the application. A “Y*” indicates that the cable type shall be permitted to be installed in the application, subject to the limitations described in 725.130 through 725.143.

**A** Class 2 and Class 3 Cable Substitutions.

The substitutions for Class 2 and Class 3 cables listed in Table 725.154(A) and illustrated in Figure 725.154(A) shall be permitted. Where substitute cables are installed, the wiring requirements of Article 725, Parts I and III, shall apply.

Informational Note: For information on Types CMP, CMR, CM, and CMX, see 800.179.

**Table 725.154(A) Cable Substitutions**

<table>
<thead>
<tr>
<th>Cable Type</th>
<th>Permitted Substitutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL3P</td>
<td>CMP</td>
</tr>
<tr>
<td>CL2P</td>
<td>CMP, CL3P</td>
</tr>
<tr>
<td>CL3R</td>
<td>CMP, CL3P, CMR</td>
</tr>
<tr>
<td>CL2R</td>
<td>CMP, CL3P, CL2P, CMR, CL3R</td>
</tr>
<tr>
<td>PLTC</td>
<td>CMP, CL3P, CMR, CL3R, CMG, CM, PLTC</td>
</tr>
<tr>
<td>CL3</td>
<td>CMP, CL3P, CMR, CL3R, CMG, CM, PLTC</td>
</tr>
<tr>
<td>CL3X</td>
<td>CMP, CL3P, CMR, CL3R, CMG, CM, PLTC, CL3, CMX</td>
</tr>
</tbody>
</table>

Figure 725.154(A) Cable Substitution Hierarchy.

**B** Class 2, Class 3, PLTC Circuit Integrity (CI) Cable or Electrical Circuit Protective System.

Circuit integrity (CI) cable or a listed electrical circuit protective system shall be permitted for use in remote control, signaling, or power-limited systems that supply critical circuits to ensure survivability for continued circuit operation for a specified time under fire conditions.

**C** Thermocouple Circuits.

Conductors in Type PLTC cables used for Class 2 thermocouple circuits shall be permitted to be any of the materials used for thermocouple extension wire.
Committee Statement

Committee Statement: CP-3 revises the title to Table 725.154 to include CMUC that is covered in the table and revises the table to include the permitted use of cable routing assemblies as Permitted by 90A.

CMP-3 does not include "Listed" in the heading as it is already in the title. The words "Wire and" were removed from the table heading as the table does not cover wire.

Response Message:

Statement of Problem and Substantiation for Public Input

Revise Table 725.154 to be consistent with the proposed changes in 725.135(C) which provide for the use of plenum cable routing assemblies in other space used for environmental air (plenums). The recommended text also revises the title of the table to clarify that Type CMUC is not a Class 2 or Class 3 cable.

Affirmative with Comment

Brewer, Larry G.

I agree with the statements of the committee
First Revision No. 630-NFPA 70-2015 [ Section No. 725.179 ]

725.179   Listing and Marking of Class 2, Class 3, and Type PLTC Cables; Communications Raceways; and Cable Routing Assemblies.

Class 2, Class 3, and Type PLTC cables, nonmetallic signaling raceways and cable routing assemblies installed as wiring methods within buildings, shall be listed as being resistant to the spread of fire and other criteria in accordance with 725.179(A) through (JH) and shall be marked in accordance with 725.179(I).

(A) Types CL2P and CL3P.

Types CL2P and CL3P plenum cable shall be listed as being suitable for use in ducts, plenums, and other space for environmental air and shall also be listed as having adequate fire-resistant and low-smoke producing characteristics.

Informational Note: One method of defining a cable that is low-smoke producing cable and fire-resistant cable is that the cable exhibits a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.52 m (5 ft) or less when tested in accordance with NFPA 262 - 2015, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.

(B) Types CL2R and CL3R.

Types CL2R and CL3R riser cables shall be marked as Type CL2R or CL3R, respectively, and be listed as suitable for use in a vertical run in a shaft or from floor to floor and shall also be listed as having fire-resistant characteristics capable of preventing the carrying of fire from floor to floor.

Informational Note: One method of defining fire-resistant characteristics capable of preventing the carrying of fire from floor to floor is that the cables pass the requirements of ANSI/UL 1666-2012, Test for Flame Propagation Height of Electrical and Optical-Fiber Cable Installed Vertically in Shafts.

(C) Types CL2 and CL3.

Types CL2 and CL3 cables shall be marked as Type CL2 or CL3, respectively, and be listed as suitable for general-purpose use, with the exception of risers, ducts, plenums, and other space used for environmental air, and shall also be listed as being resistant to the spread of fire.

Informational Note: One method of defining resistant to the spread of fire is that the cables do not spread fire to the top of the tray in the UL Flame Exposure test, Vertical Tray Flame Test, in ANSI/UL 1685-2010, Standard for Safety for Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables. The smoke measurements in the test method are not applicable. Another method of defining resistant to the spread of fire is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the CSA Vertical Flame Test for — Cables in Cable Trays, as described in CSA C22.2 No. 0.3-M-2001, Test Methods for Electrical Wires and Cables.

(D) Types CL2X and CL3X.

Types CL2X and CL3X limited-use cables shall be marked as Type CL2X or CL3X, respectively, and be listed as being suitable for use in dwellings and for use in raceway raceways and shall also be listed as being resistant to flame spread.

Informational Note: One method of determining that cable is resistant to flame spread is by testing the cable to the VW-1 (vertical wire) flame test in ANSI/UL 1581-2011, Reference Standard for Electrical Wires, Cables and Flexible Cords.

(E) Type PLTC.
Type PLTC nonmetallic-sheathed, power-limited tray cable shall be listed as being suitable for cable trays and shall consist of a factory assembly of two or more insulated conductors under a nonmetallic jacket. The insulated conductors shall be 22 AWG through 12 AWG. The conductor material shall be copper (solid or stranded). Insulation on conductors shall be rated for 300 volts. The cable core shall be either (1) two or more parallel conductors, (2) one or more group assemblies of twisted or parallel conductors, or (3) a combination thereof. A metallic shield or a metallized foil shield with drain wire(s) shall be permitted to be applied either over the cable core, over groups of conductors, or both. The cable shall be listed as being resistant to the spread of fire. The outer jacket shall be a sunlight- and moisture-resistant nonmetallic material. Type PLTC cable used in a wet location shall be listed for use in wet locations or have a moisture-impervious metal sheath.

Exception No. 1: Where a smooth metallic sheath, continuous corrugated metallic sheath, or interlocking tape armor is applied over the nonmetallic jacket, an overall nonmetallic jacket shall not be required. On metallic-sheathed cable without an overall nonmetallic jacket, the information required in 310.120 shall be located on the nonmetallic jacket under the sheath.

Exception No. 2: Conductors in PLTC cables used for Class 2 thermocouple circuits shall be permitted to be any of the materials used for thermocouple extension wire.

Informational Note: One method of defining resistant to the spread of fire is that the cables do not spread fire to the top of the tray in the UL Flame Exposure test, Vertical Tray Flame Test in ANSI/UL 1685-2010, Standard for Fire Tests of Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables. The smoke measurements in the test method are not applicable.

Another method of defining resistant to the spread of fire is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the CSA Vertical Flame Test for Cables in Cable Trays, as described in CSA C22.2 No. 0.3-M-2001, Test Methods for Electrical Wires and Cables.

(F) Circuit Integrity (CI) Cable or Electrical Circuit Protective System.

Cables that are used for survivability of critical circuits under fire conditions shall meet either 725.179(F)(1) or (F)(2) as follows:

(1) Circuit Integrity (CI) Cables.

Circuit Integrity (CI) cables, specified in 725.179(A), (B), (C), and (E), and used for survivability of critical circuits, shall have the additional classification using the suffix “CI.” Circuit integrity (CI) cables shall only be permitted to be installed in a raceway where specifically listed and marked as part of an electrical circuit protective system as covered in 725.179(F)(2).

(2) Electrical Circuit Protective System.

Cables specified in 725.179(A), (B), (C), (E), and (F)(1) that are part of an electrical circuit protective system shall be identified with the protective system number and hourly rating printed on the outer jacket of the cable and installed in accordance with the listing of the protective system.

Informational Note No. 1: One method of defining circuit integrity (CI) cable or an electrical circuit protective system is by establishing a minimum 2-hour fire-resistive rating when tested in accordance with UL 2196-2012, Standard for Tests of Fire Resistive Cables.

Informational Note No. 2: UL guide information for electrical circuit protective systems (FHIT) contains information on proper installation requirements to maintain the fire rating.

(G) Class 2 and Class 3 Cable Voltage Ratings.

Class 2 cables shall have a voltage rating of not less than 150 volts. Class 3 cables shall have a voltage rating of not less than 300 volts. Class 2 and Class 3 cables shall have temperature rating of not less than 60°C (140°F).

(H) Class 3 Single Conductors.

Class 3 single conductors used as other wiring within buildings shall not be smaller than 18 AWG and shall be Type CL3. Conductor types described in 725.49(B) that are also listed as Type CL3 shall be permitted.
Informational Note: One method of defining resistant to the spread of fire is that the cables do not spread fire to the top of the tray in the UL Flame Exposure Test - Vertical Tray Fire Test in ANSI/UL 1689-2010, Standard for Safety for Vertical- Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables. The smoke measurements in the test method are not applicable.

Another method of defining resistant to the spread of fire is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the CSA: Vertical Flame Test for Cables in Cable Trays, as described in CSA C22.2 No. 0.3-M-2001, Test Methods for Electrical Wires and Cables.

(I) Riser Cable Routing Assemblies.

Riser cable routing assemblies shall be listed as having fire-resistant characteristics capable of preventing the carrying of fire from floor to floor.

Informational Note: One method of defining fire-resistant characteristics capable of preventing the carrying of fire from floor to floor is that the cable routing assemblies pass the requirements of the test for flame propagation (riser) in Subject 2024A, UL Outline of Investigation for Cable Routing Assemblies.

(I) General-Use Cable Routing Assemblies.

General-use cable routing assemblies shall be listed as being resistant to the spread of fire.

Informational Note: One method of defining resistance to the spread of fire is that the cable routing assemblies pass the requirements of the vertical tray flame test (general use) in Subject 2024A, UL Outline of Investigation for Cable Routing Assemblies.

(I) Marking.

Cables shall be marked in accordance with 310.120(A)(2), (A)(3), (A)(4), and (A)(5), and Table 725.179(K). Voltage ratings shall not be marked on the cables. Temperature rating shall be marked on the jacket of Class 2 and Class 3 cables that have a temperature rating exceeding 60°C (140°F).

Informational Note: Voltage markings on cables may be misinterpreted to suggest that the cables may be suitable for Class 1 electric light and power applications.

Exception: Voltage markings shall be permitted where the cable has multiple listings and a voltage marking is required for one or more of the listings.

Table 725.179(K) Cable Marking

<table>
<thead>
<tr>
<th>Cable Marking</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL3P</td>
<td>Class 3 plenum cable</td>
</tr>
<tr>
<td>CL2P</td>
<td>Class 2 plenum cable</td>
</tr>
<tr>
<td>CL3R</td>
<td>Class 3 riser cable</td>
</tr>
<tr>
<td>CL2R</td>
<td>Class 2 riser cable</td>
</tr>
<tr>
<td>PLTC</td>
<td>Power-limited tray cable</td>
</tr>
<tr>
<td>CL3</td>
<td>Class 3 cable</td>
</tr>
<tr>
<td>CL2</td>
<td>Class 2 cable</td>
</tr>
<tr>
<td>CL3X</td>
<td>Class 3 cable, limited use</td>
</tr>
<tr>
<td>CL2X</td>
<td>Class 2 cable, limited use</td>
</tr>
</tbody>
</table>

Informational Note: Class 2 and Class 3 cable types are listed in descending order of fire resistance rating, and Class 3 cables are listed above Class 2 cables because Class 3 cables can substitute for Class 2 cables.

Committee Statement

Committee Statement: Signaling raceways have been replaced by communications raceways. The listing requirements for cable routing assemblies and communications raceways are in 800.182 and do not need to be repeated. This is covered in proposed Section 725.3(M) (New) and (N) (New). Note that this PI is intended to change 725.179(K) to 725.179(I).

The two informational notes have been moved to directly below 725.179(F)(2) as previously located in the NEC-2014. The mandatory temperature rating requirement located in 725.179(I) for marking have been relocated from the informational note into the mandatory text located directly before the informational note.
Statement of Problem and Substantiation for Public Input

Requiring a temperature rating of 60°C (140°F) is consistent with the UL listing requirements for these cables. Temperature marking on all high temperature rated cables will enable their appropriate application.

Statement of Problem and Substantiation for Public Input

This required information is important for personnel involved in the sales, system design, installation, servicing, and inspection of systems utilizing Power Over Ethernet (PoE) and other technologies where the cable pairs carry data and power. The conductor size in the cable is usually in the range of 22 AWG to 26 AWG. Where many cables are bundled together in a draft-free, insulated space, the heat generated by the copper conductors is an issue. However, there is an increasing demand for increasing the current level, perhaps to 1 ampere. If some of the older cable systems, using conductors as small as 26 AWG are connected to new equipment, with increased current capability, heat in the cable bundle may be a serious issue and pose a safety potential hazard. In order to design (perhaps with engineering calculations) and inspect/approve systems, accessible detailed cable information is required.

Statement of Problem and Substantiation for Public Input

Signaling raceways have been replaced by communications raceways. The listing requirements for cable routing assemblies and communications raceways are in 800.182 and do not need to be repeated. This is covered in proposed Section 725.3(M) (New). Note that this PI intended to change 725.179(M) to 725.179(I), but for some reason TerraView did not seem to make the revision correctly. This PI is one of a number of PIs submitted by the Correlating Committee Cable Routing Assembly and Communications Raceways Installation Issues Task Group. This PI, along with the others submitted by the Task Group, is intended to promote consistency in the selection, listing and installation requirements for cable routing assemblies and communications raceways throughout the Code, and align these requirement with the respective definitions in Article 100. Task Group members are: James Brunssen, Co-Chair Ernie Gallo, Co-Chair George Bish Stan Kaufman Danny Liggett Susan Stene George Straniero.

Statement of Problem and Substantiation for Public Input

The references to 725.154(A), (B), (D)(1), (E), and (F)(1) appear to be an error and have revised to 725.179(A), (B), (C), (E), and (F). See the parallel section in Article 760 (760.179). There are no Type CL2X and CL3X circuit integrity cables so reference to 725.179(D) is not included in the recommended text for 725.179(F).

Statement of Problem and Substantiation for Public Input

The listing requirements for cable routing assemblies are covered in 800.182. There is no need to duplicate the listing requirements for riser and general-purpose cable routing assemblies in Article 725. The recommended text deletes mention of communications raceways and nonmetallic signaling raceways in the opening paragraph of 725.179 because there are no listing requirements for communications raceways and nonmetallic signaling raceways in 725.179. Requiring a temperature rating of 60°C (140°F) is consistent with the UL listing requirements for these cables. Temperature marking on all high temperature rated cables will enable their
appropriate application. The references to 725.154(A), (B), (D)(1), (E), and (F)(1) appear to be an error and have revised to 725.179(A), (B), (C), (E), and (F). See the parallel section in Article 760 (760.179). There are no Type CL2X and CL3X circuit integrity cables so reference to 725.179(D) is not included in the recommended text for 725.179(F).
1) Change "ANSI C2-2007" to "ANSI/IEEE C2-2012" in the following places:
225.1 Informational Note
225.60(C) Informational Note
225.61(B) Informational Note
230.200 Informational Note

2) Change "NETA ATS-2007" to "ANSI/NETA ATS-2013" in 225.56(B) Informational Note.

Submitter Information Verification

Submitter Full Name: CMP 4
Organization: [ Not Specified ]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 02 16:50:34 EST 2015

Committee Statement

Committee Statement: This revision updates references to current editions in several places.
Response Message:

Statement of Problem and Substantiation for Public Comment
Referenced correct SDO in the informational note.


Referenced correct SDO name, and edition.
110.21 Marking.

(A) Equipment Markings.

(1) General.

The manufacturer's name, trademark, or other descriptive marking by which the organization responsible for the product can be identified shall be placed on all electrical equipment. Other markings that indicate voltage, current, wattage, or other ratings shall be provided as specified elsewhere in this Code. The marking or label shall be of sufficient durability to withstand the environment involved.

(2) Reconditioned Equipment.

Reconditioned equipment shall be marked with the name, trademark, or other descriptive marking by which the organization responsible for reconditioning the electrical equipment can be identified, along with the date of the reconditioning.

Reconditioned equipment shall be identified as "reconditioned" and approval of the reconditioned equipment shall not be based solely on the equipment's original listing.

Exception: In industrial occupancies, where conditions of maintenance and supervision ensure that only qualified persons service the equipment, the markings indicated in 110.21(A)(2) shall not be required.

Informational Note: Industry standards are available for application of reconditioned and refurbished equipment. Normal servicing of equipment that remains within a facility should not be considered reconditioning or refurbishing.

(B) Field-Applied Hazard Markings.

Where caution, warning, or danger signs or labels are required by this Code, the labels shall meet the following requirements:

(1) The marking shall warn of the hazards using effective words, colors, symbols, or any combination thereof.

Informational Note: ANSI Z535.4-2011, Product Safety Signs and Labels, provides guidelines for suitable font sizes, words, colors, symbols, and location requirements for labels.

(2) The label shall be permanently affixed to the equipment or wiring method and shall not be handwritten.

Exception to (2): Portions of labels or markings that are variable, or that could be subject to changes, shall be permitted to be handwritten and shall be legible.

(3) The label shall be of sufficient durability to withstand the environment involved.

Informational Note: ANSI Z535.4-2011, Product Safety Signs and Labels, provides guidelines for the design and durability of safety signs and labels for application to electrical equipment.

Committee Statement

Committee Statement: Revision made to comply with the NEC Style Manual.
SR 9 incorporates suggestions from PCs 582, 707 and 1550.

This provides additional guidance for reconditioned equipment. When a listed product is reconditioned (such as being rebuilt, refurbished or remanufactured) after it leaves a factory where the listing mark was applied, the organization responsible for the testing and inspection (as detailed in NEC Section 90.7) does not know if the product continues to meet the applicable certification requirements unless the reconditioning has been specifically evaluated by an organization properly equipped and qualified for making such determinations. Therefore, the AHJ should not rely solely on the equipment’s original listing mark as the basis of approval of the “reconditioned equipment.”

Industrial facilities may regularly maintain and refurbish equipment as part of a regular maintenance cycle for safety and reliability. Providing company name and trademark labels on equipment that is regularly maintained and/or refurbished by the owner/operator as part of a regular equipment maintenance program does not enhance the traceability of the work or improve the safety of the installation.

The language is added in the informational note to make it clear that normal service work such as replacing a fuse, circuit breaker or other routine work is generally not considered refurbishing or reconditioning of equipment.
(B) Field-Applied Hazard Markings.

Where caution, warning, or danger signs or labels are required by this Code, the labels shall meet the following requirements:

1. The marking shall adequately warn of the hazard using effective words and/or colors and/or symbols, or any combination thereof.

   Informational Note: ANSI Z535.4-2011, Product Safety Signs and Labels, provides guidelines for suitable font sizes, words, colors, symbols, and location requirements for labels.

2. The label shall be permanently affixed to the equipment or wiring method and shall not be hand written.

   Exception to (2): Portions of labels or markings that are variable, or that could be subject to changes, shall be permitted to be hand written and shall be legible.

3. The label shall be of sufficient durability to withstand the environment involved.

   Informational Note: ANSI Z535.4-2011, Product Safety Signs and Labels, provides guidelines for the design and durability of safety signs and labels for application to electrical equipment.

Submitter Information Verification

Committee Statement

Committee: The possibly unenforceable term and “and/or” has been removed to comply with the NEC Style Manual.

Response Message:
Second Correlating Revision No. 54-NFPA 70-2016 [Section No. 404.2(C)]

(C) Switches Controlling Lighting Loads.

The grounded circuit conductor for the controlled lighting circuit shall be installed at the location where switches control lighting loads that are supplied by a grounded general-purpose branch circuit serving bathrooms, hallways, stairways, or rooms suitable for human habitation or occupancy as defined in the applicable building code. Where multiple switch locations control the same lighting load such that the entire floor area of the room or space is visible from the single or combined switch locations, the grounded circuit conductor shall only be required at one location. A grounded conductor shall not be required to be installed at lighting switch locations under any of the following conditions:

1. Where conductors enter the box enclosing the switch through a raceway, provided that the raceway is large enough for all contained conductors, including a grounded conductor.
2. Where the box enclosing the switch is accessible for the installation of an additional or replacement cable without removing finish materials.
3. Where snap switches with integral enclosures comply with 300.15(E).
4. Where a switch serves other than a bathroom, hallway, stairway, or a room suitable for human habitation or other occupancy as defined in the applicable building code.
5. Where multiple switch locations control the same lighting load such that the entire floor area of the room or space is visible from the single or combined switch locations, the grounded circuit conductor shall only be required at one location.
6. Where lighting in the area is controlled by automatic means.
7. Where a switch controls a receptacle load.

The grounded conductor shall be extended to any switch location as necessary and shall be connected to switching devices that require line-to-neutral voltage to operate the electronics of the switch in the standby mode and shall meet the requirements of 404.22.

Exception: The connection requirement shall become effective on January 1, 2020. It shall not apply to replacement or retrofit switches installed in locations prior to local adoption of 404.2(C) and where the grounded conductor cannot be extended without removing finish materials. The number of electronic lighting control switches on a branch circuit shall not exceed five, and the number connected to any feeder on the load side of a system or main bonding jumper shall not exceed 25. For the purpose of this exception, a neutral busbar, in compliance with 200.2(B) and to which a main or system bonding jumper is connected, shall not be limited as to the number of electronic lighting control switches connected.

Informational Note: The provision for a (future) grounded conductor is to complete a circuit path for electronic lighting control devices.

Committee Statement

Committee Statement: The last sentence in the Exception has been modified to add clarity.

Committee Comment No. 2408-NFPA 70-2015 [Section No. 404.2(C)]
250.86 Other Conductor Enclosures and Raceways.

Except as permitted by 250.112(I), metal enclosures and raceways for other than service conductors shall be connected to the equipment grounding conductor.

**Exception No. 1:** Metal enclosures and raceways for conductors added to existing installations of open wire, knob-and-tube wiring, and nonmetallic-sheathed cable shall not be required to be connected to the equipment grounding conductor where these enclosures or wiring methods comply with (1) through (4) as follows:

1. Do not provide an equipment ground
2. Are in runs of less than 7.5 m (25 ft)
3. Are free from probable contact with ground, grounded metal, metal lath, or other conductive material
4. Are guarded against contact by persons

**Exception No. 2:** Short sections of metal enclosures or raceways used to provide support or protection of cable assemblies from physical damage shall not be required to be connected to the equipment grounding conductor.

**Exception No. 3:** A metal elbow or metal components shall not be required to be connected to the equipment grounding conductor where it is a supply-side bonding jumper where either of the following conditions exist:

1. The metal components are installed in a run of nonmetallic raceway(s) and is isolated from possible contact by a minimum cover of 450 mm (18 in.) to any part of the elbow or is metal components.
2. The metal components are part of an installation of nonmetallic raceway(s) and are isolated from possible contact to any part of the metal components by being encased in not less than 50 mm (2 in.) of concrete.

**Committee Statement**

The phrase "metal components" was added to each subdivision to correct a transcription error in the first draft. Isolated sections of metal conduit that meet the requirements of this section are considered to be metal components.

The exception was converted to a list to improve usability.

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

The Correlating Committee directs that further consideration be given to the comments expressed in voting on FR 1206.
Due to transcription errors the panel change in this section to mirror the same changes in 250.80 were missed. See ballot comments from Charles Mello

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

have seen requirements in contract notes on more than one occasion to provide Rigid Metal Conduit (under driveways only) along a street lighting PVC run spanning a block or more. Although I believe that PVC buried more than 18" (in this case 24") would not be a physical protection issue under a driveway, the engineer is requiring short sections of RMC under each driveway. Section 250.86 Exception #3 states "elbows" are not required to be grounded. I would like to see this exception include "short sections of RMC conduit" added.- as grounding these sections causes unnecessary additional costs and effective grounding issues.

**Affirmative with Comment**

Beckstrand, Gary A.

To require the installation of an equipment grounding conductor to a short isolated section of underground metal conduit under a road or driveway in a nonmetallic run, or a metal coupling used with a metal elbow to connect to a nonmetallic raceway, and all metal components are isolated by 18" of earth or 2" of concrete encasement, is too restrictive. It is appropriate to replace "metal elbow" with "metal components" to relax the bonding requirements as isolated metal components in underground installations do not present a significant safety hazard.
(2) Outdoor.

Outdoor installations shall comply with 110.26(E)(2)(a) through (c).

(a) Installation Requirements. Outdoor electrical equipment shall be the following:

1. Installed in suitable identified enclosures
2. Protected from accidental contact by unauthorized personnel, or by vehicular traffic
3. Protected from accidental spillage or leakage from piping systems

(b) Work Space. The working clearance space shall include the zone described in 110.26(A). No architectural appurtenance or other equipment shall be located in this zone.

Exception: Structural overhangs or roof extensions shall be permitted in this zone.

(c) Dedicated Equipment Space. The space equal to the width and depth of the equipment, and extending from grade to a height of 1.8 m (6 ft) above the equipment, shall be dedicated to the electrical installation. No piping or other equipment foreign to the electrical installation shall be located in this zone.

Committee Statement

Committee Statement: The vague and possibly unenforceable term "suitable" is replaced with the defined and enforceable term "identified" to comply with the NEC Style Manual and to add consistency throughout the code. Outdoor use enclosures are tested for exclusion of rain, and are inherently protected against accidental spillage or leakage from piping systems. Exclusion of architectural appurtenances is covered in the Exception.
Section No. 110.27(A)

**A Live Parts Guarded Against Accidental Contact.**

Except as elsewhere required or permitted by this Code, live parts of electrical equipment operating at 50 to 1000 volts, nominal shall be guarded against accidental contact by approved enclosures or by any of the following means:

1. By location in a room, vault, or similar enclosure that is accessible only to qualified persons.

2. By permanent, substantial partitions or screens arranged so that only qualified persons have access to the space within reach of the live parts. Any openings in such partitions or screens shall be sized and located so that persons are not likely to come into accidental contact with the live parts or to bring conducting objects into contact with them.

3. By insulating covers over exposed conductive parts, removable only by qualified persons having access to the space, such that it is possible to expose only one phase or polarity at a time.

4. By location on a balcony, gallery, or platform elevated and arranged so as to exclude unqualified persons.

5. By elevation above the floor or other working surface as follows:
   
   a. A minimum of 2.5 m (8 ft) for 50 volts to 300 volts between ungrounded conductors
   
   b. A minimum of 2.6 m (8 ft 6 in.) for 301 volts to 600 volts between ungrounded conductors
   
   c. A minimum of 2.62 m (8 ft 7 in.) for 601 volts to 1000 volts between ungrounded conductors

**Committee Statement**

Committee Statement: The requirement in list item (3) is adequately covered by the other parts of this section. Protection of specific equipment is identified by other sections of the code and the applicable product standards. SR 16 removes the item 3 that was added in FR 48.

Response Message:

Statement of Problem and Substantiation for Public Comment

It is unclear how list item (3) achieves equal protection, and the committee statement does not adequately explain the new allowance. (My only revision was to cross out list item 3, but for some reason Terra shows list items 4 and 5 crossed out as well. Hopefully it will show up correctly for the committee.)
110.28  Enclosure Types.

Enclosures (other than surrounding fences or walls covered in 110.31) of switchboards, switchgear, panelboards, industrial control panels, motor control centers, meter sockets, enclosed switches, transfer switches, power outlets, circuit breakers, adjustable-speed drive systems, pullout switches, portable power distribution equipment, termination boxes, general-purpose transformers, fire pump controllers, fire pump motors, and motor controllers, rated not over 1000 volts nominal and intended for such locations, shall be marked with an enclosure-type number as shown in Table 110.28.

Table 110.28 shall be used for selecting these enclosures for use in specific locations other than hazardous (classified) locations. The enclosures are not intended to protect against conditions such as condensation, icing, corrosion, or contamination that may occur within the enclosure or enter via the conduit or unsealed openings.

### Table 110.28 Enclosure Selection

<table>
<thead>
<tr>
<th>Provides a Degree of Protection Against the Following Environmental Conditions</th>
<th>For Outdoor Use</th>
<th>For Indoor Use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Enclosure Type Number</td>
<td>3 3R 3S 3X 3RX 3SX 4 4X 6 6P</td>
</tr>
<tr>
<td>Incidental contact with the enclosed equipment</td>
<td>X X X X X X X X X</td>
<td>X X X X X X X X X</td>
</tr>
<tr>
<td>Rain, snow, and sleet</td>
<td>X X X X X X X X X</td>
<td>X X X X X X X X X</td>
</tr>
<tr>
<td>Sleet*</td>
<td>X X X X X X X X X</td>
<td>X X X X X X X X X</td>
</tr>
<tr>
<td>Windblown dust</td>
<td>X X X X X X X X X</td>
<td>X X X X X X X X X</td>
</tr>
<tr>
<td>Hosedown</td>
<td>X X X X X X X X X</td>
<td>X X X X X X X X X</td>
</tr>
<tr>
<td>Corrosive agents</td>
<td>X X X X X X X X X</td>
<td>X X X X X X X X X</td>
</tr>
<tr>
<td>Temporary submersion</td>
<td>X X X X X X X X X</td>
<td>X X X X X X X X X</td>
</tr>
<tr>
<td>Prolonged submersion</td>
<td>X X X X X X X X X</td>
<td>X X X X X X X X X</td>
</tr>
</tbody>
</table>

For Outdoor Use

*Mechanism shall be operable when ice covered.

Informational Note No. 1: The term *raintight* is typically used in conjunction with Enclosure Types 3, 3S, 3SX, 3X, 4, 4X, 6, and 6P. The term *rainproof* is typically used in conjunction...
with Enclosure Types 3R and 3RX. The term *watertight* is typically used in conjunction with Enclosure Types 4, 4X, 6, and 6P. The term *driptight* is typically used in conjunction with Enclosure Types 2, 5, 12, 12K, and 13. The term *dusttight* is typically used in conjunction with Enclosure Types 3, 3S, 3SX, 3X, 5, 12, 12K, and 13.

Informational Note No. 2: Ingress protection (IP) ratings may be found in ANSI/NEMA ANSI/IEC 60529, *Degrees of Protection Provided by Enclosures*. IP ratings are not a substitute for Enclosure Type ratings.

**Submitter Information Verification**

**Committee Statement**

_**Committee**_ The correct standard designation is ANSI/IEC 60529 and this text has been changed accordingly.

_**Statement**_: accordingly.

**Response Message:**

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

Referenced current SDO in informational note 2.
(A) General.

Type AC cable shall be supported and secured by staples; listed cable ties identified as Type 2S or Type 21S; listed, labeled, and identified for securement and support; straps, hangers, or similar fittings; or other approved means designed and installed so as not to damage the cable.

Committee Statement

Committee Statement: CMP 7 removes Type 2S and Types 21S and chooses to add "labeled" to the cable ties segment for clarity and usability.

Response Message:

Statement of Problem and Substantiation for Public Comment

The language of all cable tie-related FR's between CMP 7 and CMP 8 should be harmonized. The difference between the CMP 7 FR's (1809, 1815, 1821 and 1830) and the CMP 8 FR's (2166, 2170, 2104 and 2115) is that those from CMP 7 maintained the cable tie Type classifications. CMP 8 removed these Types with the following committee statement: "Listing of cable ties approved for support of flexible conduits and cables is appropriate as the standard requires markings that identify critical performance ranges that can impact their suitability for use, including minimum and maximum operating temperature and resistance to ultraviolet light for outdoor installations. The proposed new requirements will provide objective determination for suitability of cable ties for this use".
Second Revision No. 1807-NFPA 70-2015 [ Section No. 330.30(A) ]

(A) General.

Type MC cable shall be supported and secured by staples; listed cable ties identified as Type 2S or Type 21S, listed, labeled, and identified for securement and support; straps, hangers, or similar fittings; or other approved means designed and installed so as not to damage the cable.

Committee Statement

Committee: CMP 7 removes Type 2S and Types 21S and adds "listed, labeled and identified for securement and support" to provide information to the AHJ regarding the suitability of equipment they encounter.

Response Message:

Statement of Problem and Substantiation for Public Comment

The language of all cable tie-related FR’s between CMP 7 and CMP 8 should be harmonized. The difference between the CMP 7 FR’s (1809, 1815, 1821 and 1830) and the CMP 8 FR’s (2166, 2170, 2104 and 2115) is that those from CMP 7 maintained the cable tie Type classifications. CMP 8 removed these Types with the following committee statement: "Listing of cable ties approved for support of flexible conduits and cables is appropriate as the standard requires markings that identify critical performance ranges that can impact their suitability for use, including minimum and maximum operating temperature and resistance to ultraviolet light for outdoor installations. The proposed new requirements will provide objective determination for suitability of cable ties for this use".
312.8 Switch and Overcurrent Device Enclosures.

The wiring space within enclosures for switches and overcurrent devices shall be permitted for other wiring and equipment only subject to limitations for specific equipment as provided in (A) and (B).

(A) Splices, Taps, and Feed-Through Conductors.

The wiring space of enclosures for switches or overcurrent devices shall be permitted for conductors feeding through, spliced, or tapping off to other enclosures, switches, or overcurrent devices where all of the following conditions are met:

1. The total of all conductors installed at any cross section of the wiring space does not exceed 40 percent of the cross-sectional area of that space.
2. The total area of all conductors, splices, and taps, devices and equipment installed at any cross section of the wiring space does not exceed 75 percent of the cross-sectional area of that space.
3. A warning label complying with 110.21(B) is applied to the enclosure that identifies the closest disconnecting means for any feed-through conductors.

(B) Devices and Power Monitoring Equipment.

The wiring space of enclosures for switches or overcurrent devices shall be permitted for devices and to contain power monitoring equipment where all of the following conditions are met:

1. The device or power monitoring equipment is identified as a field installable accessory as part of the listed equipment, or is a listed kit evaluated for field installation in the specific equipment switch or overcurrent device enclosures.
2. The total area of all conductors, splices, taps, devices, and equipment at any cross section of the wiring space does not exceed 75 percent of the cross-sectional area of that space.

Committee Statement

Committee Statement: CMP 9 agrees that the initial revision was excessively broad and carried unintended consequences. The inspection community does have, and has routinely applied, the tools required to police other intrusions into the wiring gutters of this equipment in the event of a problem. This action at this stage, which includes making correlating changes in the parent language, limits the additional specific coverage in this cycle to power monitoring equipment. This is now covered by a comparatively new UL Outline of Investigation (UL 2808, Guide Card XOBA, with markings that describe the CT equipment and the energy monitoring function, such as "energy-monitoring CT").

CMP 9 is retaining the two-part structure of this section so that the new Part B can be easily expanded in the future as may be judged necessary based on subsequent field experience. The final result also includes some of the language from Comment 1178, which was informed by the UL standards activity.

Response Message:

Public Comment No. 1178-NFPA 70-2015 [Section No. 312.8]
As noted in the substantiation to FR 2404, this revisions is intended to limit the inclusion of devices and equipment in a wiring space to those that are identified as field installable...
accessories as part of the listed equipment, or as a listed kit evaluated for field installation in the specific equipment. The phrase "listed kit evaluated for field installation in the specific equipment" may be interpreted as requiring a kit to include an itemized list of the "specific equipment" with which the kit is compatible. Additionally, this equipment may be provided in designs which are not considered a "kit". As the original submitter of the Public Input which generated the First Revision, I am providing a Public Comment which is intended to clarify a portion of this requirement in a way that is consistent with my original intent. The substantive change to the wording in 312.8(B)(1) ("...the device or equipment is listed as being evaluated for field installation in switch or overcurrent device enclosures.") would meet the original intent, which is to ensure the added device or equipment is listed equipment that has been evaluated for field installation in the application. The UL category for "Energy-Monitoring Current Transformers" (XOBA) is an example of equipment that would satisfy this requirement.

**Public Comment No. 1077-NFPA 70-2015 [Section No. 312.8(B)]**
The safety risks associated with the installation of devices in the wiring space of enclosures for switches or overcurrent devices are best addressed by the listing of the devices in question. The proposed edit allows for devices to be evaluated in a type of enclosure, rather than each individual make/model. This, along with the provision to limit the cross-sectional area, will satisfy the intent of the proposal while allowing for devices to be installed in existing installations, where individual evaluations would be impractical or impossible. The proposal as written would have unintended, far-reaching implications, and affect the already widespread use of devices and current transformers in energy management and monitoring systems.

**Public Comment No. 1479-NFPA 70-2015 [Section No. 312.8(B)]**
The addition of 312.8 (B) would limit the installation of devices and equipment to only those enclosures that were specifically assessed within by qualified test labs. Due to the large number of enclosures currently on the market, and the even greater number of discontinued enclosures already in the field, this requirement is so burdensome as to be completely impractical, and would result in the elimination of any 3rdparty devices from the market. These 3rdparty devices have proven to be the only viable way of addressing the current install base of enclosures across the US. 3rdparty devices fill a critical role in the growth of renewable energy by providing the necessary sensor data to optimally manage a home’s participation on the grid. Lack of such information will hinder the deployment of technologies such as solar, battery storage, microgrid and demand response which are key to achieving a stable, sustainable grid. In their statement regarding this proposed change, CMP9 references an earlier proposal to allow the installation of utilization equipment which was rejected in the 2011 cycle. We recognize that the wide variety of existing devices classified as ‘utilization equipment’ and not designed for installation inside enclosures could result in obstruction and hazard. However, we propose that a device specifically designed for installation within any listed enclosures and evaluated by qualified test lab for installation inside any listed enclosures can be safely installed. In order to provide clarity, we suggest the NEC specifies that a device may only be installed inside an enclosure if it is listed and approved for installation inside any listed enclosure by a qualified test lab. The installation of the device must not force any components (e.g. splices, taps, conductors) out of compliance with the NEC. To address CMP9’s concerns about obstructions in the enclosure, we propose a limit on the amount of space that can be occupied by the device, splices, taps and conductors in any crosssectional area. Evaluation of this limit should should be performed by the Inspector during the standard inspection process. A field evaluation would not be practical as no network of evaluators exists that could handle the required volume.

**Public Comment No. 1450-NFPA 70-2015 [Section No. 312.8(B)]**
The proposed modification to section 312.8 puts significant restrictions on the installation of 3rd party devices and equipment to only those enclosures that were assessed within by qualified test labs. 3rd part devices play an important role in the growth of home energy management and energy efficiency, connected home devices, renewable energy technologies such as solar and battery storage, and in enabling microgrids and providing utility services such as demand response for a sustainable grid. Due to the large number of enclosures currently on the market,
and the even greater number of discontinued enclosures already in the field, this requirement is so burdensome as to be completely impractical, and would result in the elimination of 3rd party devices that are critical to enabling the above listed technology advancements. We fully recognize CMP9’s concerns around potential obstruction and hazard, and in order to provide clarity, we suggest the NEC specifies that a device may only be installed inside an enclosure if it is listed and approved for installation inside any listed enclosure by a qualified test lab. The installation of the device must not force any components (e.g. splices, taps, conductors) out of compliance with the NEC. To address CMP9’s concerns about obstructions in the enclosure, we propose a limit on the amount of space that can be occupied by the device, splices, taps and conductors in any cross sectional area. Evaluation of this limit should be performed by the Inspector during the standard inspection process. A field evaluation would not be practical as no network of evaluators exists that could handle the required volume.

Public Comment No. 1508-NFPA 70-2015 [Section No. 312.8(B)]
It will be impractical to submit current transformers (CT) for ALL enclosures (new or old). Therefore I recommend to use the following statement: The device or equipment is listed and evaluated for installation within ANY listed enclosure.

Public Comment No. 1510-NFPA 70-2015 [Section No. 312.8(B)]
The addition of 312.8 (B) would limit the installation of devices and equipment to only those enclosures that they were specifically assessed within by qualified test labs. Due to the large number of enclosures currently on the market, and the even greater number of discontinued enclosures already in the field, this requirement is so burdensome as to be completely impractical, and would result in the elimination of any 3rd party devices from the market. These 3rd party devices have proven to be the only viable way of addressing the current install base of enclosures across the US. 3rd party devices fill a critical role in the growth of renewable energy by providing the necessary sensor data to optimally manage a home’s participation on the grid. Lack of such information will hinder the deployment of technologies such as solar, battery storage, microgrid and demand response which are key to achieving a stable, sustainable grid. In their statement regarding this proposed change, CMP9 references an earlier proposal to allow the installation of utilization equipment which was rejected in the 2011 cycle. We recognize that the wide variety of existing devices classified as ‘utilization equipment’ and not designed for installation inside enclosures could result in obstruction and hazard. However, we propose that a device specifically designed for installation within any listed enclosures and evaluated by qualified test lab for installation inside any listed enclosures can be safely installed. In order to provide clarity, we suggest the NEC specifies that a device may only be installed inside an enclosure if it is listed and approved for installation inside any listed enclosure by a qualified test lab. The installation of the device must not force any components (e.g. splices, taps, conductors) out of compliance with the NEC. To address CMP9’s concerns about obstructions in the enclosure, we propose a limit on the amount of space that can be occupied by the device, splices, taps and conductors in any cross-sectional area. Evaluation of this limit should be performed by the Inspector during the standard inspection process. A field evaluation would not be practical as no network of evaluators exists that could handle the required volume.

Public Comment No. 1513-NFPA 70-2015 [Section No. 312.8]
This FR should be revised to delete the new 312.8(B) and revert back to the NEC 2014 language with only the addition of "devices and equipment". The original PI3091 cited "proliferation of devices and equipment" as substantiation for the change, however, the PI did not include any data that can be substantiated as safety concerns and how the PI would address those concerns. This proposal would effectively prohibit the installation of LISTED current transformers or meters for energy monitoring in any switch and overcurrent device enclosures, unless every possible current transformer or meter was evaluated and listed for use in every possible enclosure in their every possible internal, both factory and field installed, configurations. this will put a financially insurmountable burden and a vitrually impossible requirement on, but not limited to, the submetering industry, and to effectively limit all devices within switch and overcurrent device enclosures to only those made by the enclosure.
manufacturer and could thus be perceived within the context of restraint of trade. Additionally, this proposal will slow the introduction of new enclosure models as well as prohibiting entry of new enclosure manufacturers/suppliers, because all new enclosures will lack products "listed" for use with/within them. Bust most of all, the submetering industry as a whole has had an excellent safety record with respect to recognized and listed metering devices placed within switch and overcurrent device enclosures, and the original PI had provided no evidence to prove otherwise. It seems that if the committee was concerned with maintaining adequate wiring space, the solution would be to include "devices and equipment" as part of the cross section calculations, as proposed in 312.8(A)(@) of FR2404.

Public Comment No. 1367-NFPA 70-2015 [Section No. 312.8(B)]
As originally worded, it appears this proposal would prohibit the installation of current transformers or meters for energy monitoring in any switch and overcurrent device enclosures unless every possible current transformer or meter was evaluated and listed for use in every possible enclosure. If this interpretation is correct, it puts a financially insurmountable burden on the submetering industry. The industry as a whole has an excellent safety record with respect to recognized and listed metering devices placed within switch and overcurrent device enclosures. The success of such applications over multiple decades of use, together with the originally proposed wording for [Part B] seems, in practice, to effectively limit devices permitted within switch and overcurrent device enclosures to only those made by the enclosure manufacturer and could thus be perceived within the context of restraint of trade. Furthermore, this restriction would make it nearly impossible to retrofit submetering into existing homes, commercial, and industrial facilities, especially those using discontinued enclosures for which no current transformers have been approved.

Public Comment No. 1428-NFPA 70-2015 [Section No. 312.8(B)]
The first draft language would prevent the installation of 3rd party monitors that make use of Current Transformers (CTs) to provide data that supports renewable credits, revenue-grade metering, and conservation efforts that focus on consumer awareness. Further, such data will be important to support the development of micro-grid and battery storage, which are integral technologies to the growth of renewable energy. We believe the proposed change strikes a good balance - both increasing safety and allowing for innovation and interoperability.

Public Comment No. 1644-NFPA 70-2015 [Section No. 312.8(B)]
I tend to agree with Neurio Technology Inc's take here, but this even seems like it could quickly escalate into bureaucratic overkill, putting unhelpful burdens on new construction as well as remodels, stifling SAFE, modern, Green Initiatives: The addition of 312.8 (B) would limit the installation of devices and equipment to only those enclosures that they were specifically assessed within by qualified test labs. Due to the large number of enclosures currently on the market, and the even greater number of discontinued enclosures already in the field, this requirement is so burdensome as to be completely impractical, and would result in the elimination of any 3rdparty devices from the market. These 3rdparty devices have proven to be the only viable way of addressing the current install base of enclosures across the US. 3rdparty devices fill a critical role in the growth of renewable energy by providing the necessary sensor data to optimally manage a home’s participation on the grid. Lack of such information will hinder the deployment of technologies such as solar, battery storage, microgrid and demand response which are key to achieving a stable, sustainable grid. In their statement regarding this proposed change, CMP9 references an earlier proposal to allow the installation of utilization equipment which was rejected in the 2011 cycle. We recognize that the wide variety of existing devices classified as 'utilization equipment' and not designed for installation inside enclosures could result in obstruction and hazard. However, we propose that a device specifically designed for installation within any listed enclosures and evaluated by qualified test lab for installation inside any listed enclosures can be safely installed. In order to provide clarity, we suggest the NEC specifies that a device may only be installed inside an enclosure if it is listed and approved for installation inside any listed enclosure by a qualified test lab. The installation of the device must
not force any components (e.g. splices, taps, conductors) out of compliance with the NEC. To address CMP9’s concerns about obstructions in the enclosure, we propose a limit on the amount of space that can be occupied by the device, splices, taps and conductors in any cross-sectional area. Evaluation of this limit should should be performed by the Inspector during the standard inspection process. A field evaluation would not be practical as no network of evaluators exists that could handle the required volume.

Public Comment No. 1648-NFPA 70-2015 [Section No. 312.8(B)]
The addition of 312.8 (B) would limit the installation of devices and equipment to only those enclosures that they were specifically assessed within by qualified test labs. Due to the large number of enclosures currently on the market, and the even greater number of discontinued enclosures already in the field, this requirement is so burdensome as to be completely impractical, and would result in the elimination of any 3rd-party devices from the market. These 3rd-party devices have proven to be the only viable way of addressing the current install base of enclosures across the US. 3rd-party devices fill a critical role in the growth of renewable energy by providing the necessary sensor data to optimally manage a home’s participation on the grid. Lack of such information will hinder the deployment of technologies such as solar, battery storage, micro-grid and demand response which are key to achieving a stable, sustainable grid. In their statement regarding this proposed change, CMP9 references an earlier proposal to allow the installation of utilization equipment which was rejected in the 2011 cycle. We recognize that the wide variety of existing devices classified as ‘utilization equipment’ and not designed for installation inside enclosures could result in obstruction and hazard. However, we propose that a device specifically designed for installation within any listed enclosures and evaluated by qualified test lab for installation inside any listed enclosures can be safely installed. In order to provide clarity, we suggest the NEC specifies that a device may only be installed inside an enclosure if it is listed and approved for installation inside any listed enclosure by a qualified test lab. The installation of the device must not force any components (e.g. splices, taps, conductors) out of compliance with the NEC. To address CMP9’s concerns about obstructions in the enclosure, we propose a limit on the amount of space that can be occupied by the device, splices, taps and conductors in any cross-sectional area. Evaluation of this limit should should be performed by the Inspector during the standard inspection process. A field evaluation would not be practical as no network of evaluators exists that could handle the required volume.

Public Comment No. 1621-NFPA 70-2015 [Section No. 312.8(B)]
Sunrun supports the proposed alternative code language for NEC 312.8. The proposed changes offered here eliminate unnecessary restrictions that would keep third party devices from being installed insider enclosures. Implementation of the proposed NEC 312.8 as written would prohibit the placement of home sided sub-metering equipment within enclosures. Effectively this change prohibits the home owner from metering his or her load without the upgrade of the entire panel board, which may render a project economically or technically not feasible. Due to the large number of enclosures currently on the market, and the even greater number of discontinued enclosures already in the field, this requirement would result in the elimination of any third party devices from the market. Residences will not be able to use third party metering for the purposes of assessing their consumption either for general knowledge or analysis of their usage on a time of use rate or other similarly time dependent rate structure. The ability to collect and monitor this data will be important to the growth of renewable energy, providing the necessary sensor data to optimally manage a home’s participation on the grid. Lack of such information will hinder the deployment of technologies such as solar, battery storage, micro-grid and demand response which are key to achieving a stable, sustainable grid.

Public Comment No. 1530-NFPA 70-2015 [Section No. 312.8(B)]
The addition of 312.8 (B) would limit the installation of devices and equipment to only those enclosures that they were specifically assessed within by qualified test labs. Due to the large number of enclosures currently on the market, and the even greater number of discontinued enclosures on the market, and even greater number of discontinued
enclosures already in the field, this requirement is so burdensome as to be completely impractical, and would result in the elimination of any 3rd-party devices from the market. These 3rd-party devices have proven to be the only viable way of addressing the current install base of enclosures across the US. 3rd-party devices fill a critical role in the growth of renewable energy by providing the necessary sensor data to optimally manage a home’s participation on the grid. Lack of such information will hinder the deployment of technologies such as solar, battery storage, micro-grid and demand response which are key to achieving a stable, sustainable grid. In their statement regarding this proposed change, CMP9 references an earlier proposal to allow the installation of utilization equipment which was rejected in the 2011 cycle. We recognize that the wide variety of existing devices classified as ‘utilization equipment’ and not designed for installation inside enclosures could result in obstruction and hazard. However, we propose that a device specifically designed for installation within any listed enclosures and evaluated by qualified test lab for installation inside any listed enclosures can be safely installed. In order to provide clarity, we suggest the NEC specifies that a device may only be installed inside an enclosure if it is listed and approved for installation inside any listed enclosure by a qualified test lab. The installation of the device must not force any components (e.g. splices, taps, conductors) out of compliance with the NEC. To address CMP9’s concerns about obstructions in the enclosure, we propose a limit on the amount of space that can be occupied by the device, splices, taps and conductors in any cross-sectional area. Evaluation of this limit should be performed by the Inspector during the standard inspection process. A field evaluation would not be practical as no network of evaluators exists that could handle the required volume.

Public Comment No. 1603-NFPA 70-2015 [Section No. 312.8]
Section 312.8 in the NEC-2014 permits Splices, Taps, and Feed-Through Conductors in the wiring space. The installation of listed monitoring or measuring equipment in industrial buildings, multiuse commercial, university campus buildings and Government facilities is vital to determine their energy usage and develop programs to reduce their energy consumption and carbon footprint. Components of the listed monitoring or measuring equipment may need to be in the wire bending space of the equipment that is already installed to accomplish this. The current section does not address this equipment and does not provide any guidance to the AHJ. With no guidance it may prevent the installation of equipment needed to meet this important emerging need or lead to unsafe installation. FR 2404 as written can be confusing because of the use of devices and equipment. It is unclear if the requirement applies to all equipment in the enclosure and how one would distinguish the wiring space from the equipment space for some types of enclosures, particularly those used for industrial control equipment. This proposal specifically addresses energy management or measuring equipment that is installed in the wiring space. It is the addition of this equipment that is the issue at present and is what the FR should address. Adding the requirement for Listed equipment and applying the same area limitation will enhance the safety of the installation. The language of the proposal also establishes enforceable guidelines for the AHJ through the Listing and specific area requirements. This proposal also supports the important trend of energy measurement enabling conservation and reduction of carbon footprint. Many municipalities are in process of or are considering legislating energy measurement. The code should be aligned with this emerging need while providing the guidance for safe installations.

Public Comment No. 1608-NFPA 70-2015 [Section No. 312.8(B)]
The addition of 312.8 (B) would limit the installation of devices and equipment to only those enclosures that they were specifically assessed within by qualified test labs. Due to the large number of enclosures currently on the market, and the even greater number of discontinued enclosures already in the field, this requirement is so burdensome as to be completely impractical, and would result in the elimination of any 3rd party devices from the market. These 3rd party devices have proven to be the only viable way of addressing the current install base of enclosures across the US. 3rd party devices fill a critical role in the growth of renewable energy by providing the necessary sensor data to optimally manage a home’s participation on the grid. Lack of such information will hinder the deployment of technologies such as solar, battery...
storage, micro-grid and demand response which are key to achieving a stable, sustainable grid.

In their statement regarding this proposed change, CMP9 references an earlier proposal to allow the installation of utilization equipment which was rejected in the 2011 cycle. We recognize that the wide variety of existing devices classified as ‘utilization equipment’ and not designed for installation inside enclosures could result in obstruction and hazard. However, we propose that a device specifically designed for installation within any listed enclosures and evaluated by qualified test lab for installation inside any listed enclosures can be safely installed. In order to provide clarity, we suggest the NEC specifies that a device may only be installed inside an enclosure if it is listed and approved for installation inside any listed enclosure by a qualified test lab. The installation of the device must not force any components (e.g. splices, taps, conductors) out of compliance with the NEC. To address CMP9’s concerns about obstructions in the enclosure, we propose a limit on the amount of space that can be occupied by the device, splices, taps and conductors in any cross-sectional area. Evaluation of this limit should should be performed by the Inspector during the standard inspection process. A field evaluation would not be practical as no network of evaluators exists that could handle the required volume.

Public Comment No. 1578-NFPA 70-2015 [Section No. 312.8(B)]
The addition of 312.8 (B) would limit the installation of devices and equipment to only those enclosures that they were specifically assessed within by qualified test labs. Due to the large number of enclosures currently on the market, and the even greater number of discontinued enclosures already in the field, this requirement is so burdensome as to be completely impractical, and would result in the elimination of any 3rd-party devices from the market. These 3rd-party devices have proven to be the only viable way of addressing the current install base of enclosures across the US. 3rd-party devices fill a critical role in the growth of renewable energy by providing the necessary sensor data to optimally manage a home’s participation on the grid. Lack of such information will hinder the deployment of technologies such as solar, battery storage, microgrid and demand response which are key to achieving a stable, sustainable grid. In their statement regarding this proposed change, CMP9 references an earlier proposal to allow the installation of utilization equipment which was rejected in the 2011 cycle. We recognize that the wide variety of existing devices classified as ‘utilization equipment’ and not designed for installation inside enclosures could result in obstruction and hazard. However, we propose that a device specifically designed for installation within any listed enclosures and evaluated by qualified test lab for installation inside any listed enclosure by a qualified test lab. The installation of the device must not force any components (e.g. splices, taps, conductors) out of compliance with the NEC. To address CMP9’s concerns about obstructions in the enclosure, we propose a limit on the amount of space that can be occupied by the device, splices, taps and conductors in any cross-sectional area. Evaluation of this limit should should be performed by the Inspector during the standard inspection process. A field evaluation would not be practical as no network of evaluators exists that could handle the required volume.

Public Comment No. 1118-NFPA 70-2015 [Section No. 312.8(B)]
The addition of 312.8 (B) would limit the installation of devices and equipment to only those enclosures that they were specifically assessed within by qualified test labs. Due to the large number of enclosures currently on the market, and the even greater number of discontinued enclosures already in the field, this requirement is so burdensome as to be completely impractical, and would result in the elimination of any 3rd-party devices from the market. These 3rd-party devices have proven to be the only viable way of addressing the current install base of enclosures across the US. 3rd-party devices fill a critical role in the growth of renewable energy by providing the necessary sensor data to optimally manage a home’s participation on the grid. Lack of such information will hinder the deployment of technologies such as solar, battery storage, microgrid and demand response which are key to achieving a stable, sustainable grid. In their statement regarding this proposed change, CMP9 references an
earlier proposal to allow the installation of utilization equipment which was rejected in the 2011 cycle. We recognize that the wide variety of existing devices classified as ‘utilization equipment’ and not designed for installation inside enclosures could result in obstruction and hazard. However, we propose that a device specifically designed for installation within any listed enclosure and evaluated by a qualified test lab for installation inside any listed enclosure can be safely installed. In order to provide clarity, we suggest the NEC specifies that a device may only be installed inside an enclosure if it is listed and approved for installation inside any listed enclosure by a qualified test lab. The installation of the device must not force any components (e.g. splices, taps, conductors) out of compliance with the NEC. To address CMP9’s concerns about obstructions in the enclosure, we propose a limit on the amount of space that can be occupied by the device, splices, taps and conductors in any cross-sectional area. Evaluation of this limit should should be performed by the Inspector during the standard inspection process. A field evaluation would not be practical as no network of evaluators exists that could handle the required volume.

Public Comment No. 1046-NFPA 70-2015 [Section No. 312.8]
As originally worded, this proposal appears to prohibit the field installation of truly an infinite number of flange and/or surface mounted devices whereby terminations must protrude into the interior panel enclosure space. Specific to electrical wiring devices, potentially affected products could include manual controllers, flanged straight blade and locking inlets and outlets, cam-type panel mount devices and IEC 309 pin & sleeve receptacles. In each case, the device terminations protrude inside of the enclosure if they are panel mounted on the exterior of the panelboard or motor control center. These are not atypical applications; similarly, it places a completely unreasonable burden on the manufacturers of these devices to ensure that replacement kits or the flange/surface mounted devices themselves are listed to the (once again) infinite number of panelboard and/or motor control center products offered by industry. The request here is to revert to the existing 2014 NFPA 70 text for NEC® 312.8. Thank you.

Public Comment No. 1054-NFPA 70-2015 [Section No. 312.8]
The inclusion of devices and equipment is too broad and verification that all safety aspects were addressed would be very difficult. Power monitoring equipment could be installed using the general rules of this section without impacting the performance of the overcurrent devices installed in the enclosure.

Public Comment No. 1298-NFPA 70-2015 [Section No. 312.8(B)]
I am director of measurement and verification for a company in the Pacific Northwest. We measure performance of homes and businesses in our region and those data feed directly into the regional planning process. We have carried out this work for over 25 years and have installed or overseen installation of rated devices such as power transducers and current transformers in a wide range of electrical panels (manufactured between the mid-1950s and present). All of the equipment we have utilized is rated for use in panels and we have had no long-term, serious issues over hundreds of sites. The intent of the proposed language in this section of the Standard would seem to be to unnecessarily constrain the types of equipment that can be installed in load centers. There is no technical or safety reason I can see for this so I must assume the intent is to artificially limit the supply chain so as to maximize profits for the panel manufacturers. I strenuously object to this limitation as it has no technical or safety basis and would make it much harder for our region to carry out various types of research that are intended to deliver electricity and natural gas resources to consumers at the lowest possible cost.

Public Comment No. 1307-NFPA 70-2015 [Section No. 312.8(B)]
The addition of 312.8 (B) would limit the installation of devices and equipment to only those enclosures that they were specifically assessed within by qualified test labs. Due to the large number of enclosures currently on the market, and the even greater number of discontinued enclosures already in the field, this requirement is so burdensome as to be completely
impractical, and would result in the elimination of any 3rd party devices from the market. This includes independent metering devices designed to measure the power use of a variety of end uses. This is critically important for my field - energy efficiency research. Without knowing how much energy something uses in the field, we cannot make accurate calculations of how much energy it saves. Laboratory testing for energy use does not replicate field conditions, which are more varied than the lab can provide. Enclosures are largely similar to one another and it should be fairly straightforward to design a test procedure that can ensure safety in all of them.

Public Comment No. 1329-NFPA 70-2015 [Section No. 312.8(B)]
As this provision is currently written, it would be nearly impossible, and therefore impractical, to certify any new accessories for all existing and new models of equipment. It would hinder efforts of homeowners who wish to utilize energy monitoring and management equipment as well as renewable energy and battery backup systems. There are many ways to provide options for fire safety within an electrical system but these regulations should not come at the expense of improving and evolving energy balancing technology and hardware.

Public Comment No. 1182-NFPA 70-2015 [Section No. 312.8]
As originally worded, it appears this proposal would prohibit the installation of current transformers or meters for energy monitoring in any switch and overcurrent device enclosures unless every possible current transformer or meter was evaluated and listed for use in every possible enclosure. If this interpretation is correct, it puts a financially insurmountable burden on the submetering industry. The industry as a whole has an excellent safety record with respect to recognized and listed metering devices placed within switch and overcurrent device enclosures. The success of such applications over multiple decades of use, together with the originally proposed wording for [Part B] seems, in practice, to effectively limit devices permitted within switch and overcurrent device enclosures to only those made by the enclosure manufacturer and could thus be perceived within the context of restraint of trade.

Public Comment No. 1180-NFPA 70-2015 [Section No. 312.8]
As originally worded, it appears this proposal would prohibit the installation of current transformers or meters for energy monitoring in any switch and overcurrent device enclosures unless every possible current transformer or meter was evaluated and listed for use in every possible enclosure. If this interpretation is correct, it puts a financially insurmountable burden on the submetering industry. The industry as a whole has an excellent safety record with respect to recognized and listed metering devices placed within switch and overcurrent device enclosures. The success of such applications over multiple decades of use, together with the originally proposed wording for [Part B] seems, in practice, to effectively limit devices permitted within switch and overcurrent device enclosures to only those made by the enclosure manufacturer and could thus be perceived within the context of restraint of trade as anti-competitive.

Public Comment No. 1700-NFPA 70-2015 [Section No. 312.8]
The addition of 312.8 (B) would limit the installation of devices and equipment to only those enclosures that they were specifically assessed within by qualified test labs. Due to the large number of enclosures currently on the market, and the even greater number of discontinued enclosures already in the field, this requirement is so burdensome as to be completely impractical, and would result in the elimination of any 3rd party devices from the market. These 3rd party devices have proven to be the only viable way of addressing the current install base of enclosures across the US. 3rd party devices fill a critical role in the growth of renewable energy by providing the necessary sensor data to optimally manage a home’s participation on the grid. Lack of such information will hinder the deployment of technologies such as solar, battery storage, microgrid and demand response which are key to achieving a stable, sustainable grid. In their statement regarding this proposed change, CMP9 references an earlier proposal to allow the installation of utilization equipment which was rejected in the 2011 cycle. We recognize that the wide variety of existing devices classified as ‘utilization equipment’ and not designed for installation inside enclosures could result in obstruction and hazard. However, we
propose that a device specifically designed for installation within any listed enclosures and evaluated by qualified test lab for installation inside any listed enclosures can be safely installed. In order to provide clarity, we suggest the NEC specifies that a device may only be installed inside an enclosure if it is listed and approved for installation inside any listed enclosure by a qualified test lab. The installation of the device must not force any components (e.g. splices, taps, conductors) out of compliance with the NEC. To address CMP9’s concerns about obstructions in the enclosure, we propose a limit on the amount of space that can be occupied by the device, splices, taps and conductors in any cross-sectional area. Evaluation of this limit should be performed by the Inspector during the standard inspection process. A field evaluation would not be practical as no network of evaluators exists that could handle the required volume.

Public Comment No. 606-NFPA 70-2015 [Section No. 312.8]
As originally worded, it appears this would prohibit the installation of current transformers or meters for energy monitoring in any switch and overcurrent device enclosures unless every possible current transformer or meter was evaluated and listed for use in every possible enclosure. If this interpretation is correct, it puts a financially insurmountable burden on the submetering industry. The industry as a whole has an excellent safety record with respect to recognized and listed metering devices placed within switch and overcurrent device enclosures. The success of such applications over multiple decades of use, together with the originally proposed wording for [Part B] seems, in practice, to effectively limit devices permitted within switch and overcurrent device enclosures to only those made by the enclosure manufacturer and could thus be perceived within the context of restraint of trade.

Public Comment No. 960-NFPA 70-2015 [Section No. 312.8(B)]
The originally proposed wording would prohibit the installation of UL Listed accessories specifically tested and certified for use in switch and overcurrent device enclosures (e.g. panelboards). As millions of such products are currently installed and there is no evidence of any safety issue resulting from such installation, this seems to be an effort to force manufacturers of such products out of the marketplace. The wording change is both onerous and unfairly restrictive.

Public Comment No. 1456-NFPA 70-2015 [Section No. 312.8(B)]
The addition of 312.8 (B) would limit the installation of devices and equipment to only those enclosures that they were specifically assessed within by qualified test labs. Due to the large number of enclosures currently on the market, and the even greater number of discontinued enclosures already in the field, this requirement is so burdensome as to be completely impractical, and would result in the elimination of any 3rdparty devices from the market. These 3rdparty devices have proven to be the only viable way of addressing the current install base of enclosures across the US. 3rdparty devices fill a critical role in the growth of renewable energy by providing the necessary sensor data to optimally manage a home’s participation on the grid. Lack of such information will hinder the deployment of technologies such as solar, battery storage, microgrid and demand response which are key to achieving a stable, sustainable grid. In their statement regarding this proposed change, CMP9 references an earlier proposal to allow the installation of utilization equipment which was rejected in the 2011 cycle. We recognize that the wide variety of existing devices classified as ‘utilization equipment’ and not designed for installation inside enclosures could result in obstruction and hazard. However, we propose that a device specifically designed for installation within any listed enclosures and evaluated by qualified test lab for installation inside any listed enclosures can be safely installed. In order to provide clarity, we suggest the NEC specifies that a device may only be installed inside an enclosure if it is listed and approved for installation inside any listed enclosure by a qualified test lab. The installation of the device must not force any components (e.g. splices, taps, conductors) out of compliance with the NEC. To address CMP9’s concerns about obstructions in the enclosure, we propose a limit on the amount of space that can be occupied by the device, splices, taps and conductors in any cross-sectional area. Evaluation of
this limit should be performed by the Inspector during the standard inspection process. A field evaluation would not be practical as no network of evaluators exists that could handle the required volume.

Public Comment No. 977-NFPA 70-2015 [Section No. 312.8]

As proposed, this First Revision FR 2404 (and the Public Input PI 3091) revision to NEC® 312.8 is neither enforceable as worded, practicable in application, nor sufficiently justified to warrant these changes. Revert to existing 2014 text for NEC® 312.8. FIELD-INSTALLABLE ACCESSORIES AS PART OF LISTED EQUIPMENT and LISTED KITS Public Input PI 3091 that served as the basis for First Revision FR 2404 rationalized these changes: “There is a proliferation of devices and equipment intended by non-OEM’s to be installed in enclosures containing PANELBOARDS.” Article 408 covers panelboards; Article 312, by contrast, covers CABINETS. These are typically EMPTY enclosures that are “populated” by equipment that the electrician provides at the installation. Firstly, NEC® Article 312 has no requirement that cabinets, as defined in Article 100, be listed. Indeed, such cabinets presently may be field-fabricated for the installation. Yet NEC® 312.8 as revised by FR 2404 mandates that these devices and equipment be either LISTED accessories or LISTED kits in relation to these enclosures. Even those electrical enclosures that are listed do so in accordance with UL Standard UL 50. These are empty enclosures, typically listed by ENCLOSURE manufacturers who do NOT make any of the devices or equipment that go inside or are attached to such UL 50 enclosures. Those devices and equipment are manufactured by manufacturers with specialization and competence to manufacture such devices and equipment. As such, there has ALWAYS been a “proliferation” of devices and equipment made by OTHER THAN the cabinet enclosure manufacturers. If there are specific hazards for panelboards, identify exactly what they are and address them in Article 408, not in Article 312. To now require that manufacturers of such devices and equipment get them listed for EACH and EVERY enclosure manufacturer’s cabinets is fundamentally unachievable. Certainly, the enclosure manufacturers do not have the resources or desire to list as an accessory or kits EACH and EVERY device and equipment that could potentially go in or on their enclosures. As proposed, the 312.8(B)(1) wording of PI 3091 and FR 2404 is not remotely achievable, especially when cabinets onto themselves are not required by Article 312 to be listed. ENCLOSURE GEOMETRY NEC® 312.6(A) and Table 312.6(A) establish the width of passages for conductors called wiring gutters. The width requirement is based upon the size of the conductors in PARALLEL. As such, knowing the measureable width and depth of gutters, the cross-sectional AREA can be calculated. Percentages of conductor fill can be enforced. Any intrusion of a device or equipment in an enclosure effectively re-establishes new (reduced) gutter widths for conductor to pass around the intrusion. Those new (reduced) gutters (conductor passages) still must comply with existing Table 312.6(A). Consequently, those existing Table 312.6(A) gutter widths can still be enforced. By contrast, the 312.8(B)(2) wording of PI 3091 and FR 2404 is not necessarily looking at where the CONDUCTORS are in PARALLEL but rather where the devices and equipment intrude into the VOLUME of the cabinet enclosure (where conductors are not necessarily running in parallel) and attempt to apply an UNORIENTED cross-section AREA restriction upon a VOLUME. Worded as it is, by whatever the issue unexplained by PI3091 may or may not be, how would this requirement ever be interpreted consistently for enforcement? FR2404 seems to be a solution looking for a problem to solve.

Affirmative with Comment

Young, Ralph H.

Requiring the Power Monitoring Equipment to have the specific listing requirements in 312.8(B)(1) is unnecessary. Using a listed Power Monitoring Device that meets the space requirements of 312.8(B)(2) is sufficient.
Negative with Comment
Osborne, Robert D.

With the removal of the word “only” in the parent text of 312.8, CMP 9 has dramatically changed the scope of this Section of the Code. As recent as the Code Cycle for the 2011 Code, CMP 9 rejected the idea of allowing utilization equipment within cabinets covered by Section 312.8. The revised text now allows for “other equipment” without limitation (unless that equipment is “Power Monitoring Equipment”). This “other equipment” is not subject to evaluation to determine its suitability within the cabinet and could result in obstructions or additional heating that is not consistent with the design or evaluation of the equipment. For example, in the case of panelboards (a common application of Section 312.8), requirements for the field installation of equipment within the panelboard enclosure are detailed in the Standard for Panelboards, UL 67. The restrictions that are a part of this product Standard are not included in 312.8, nor are they part of the evaluation of “generic” equipment that will now be permitted within the panelboard enclosure. Field installation of “other equipment” that is not evaluated for the specific application constitutes a field modification and the installer and AHJ will be left with determining how the modification effects compliance with the product Standard.
(C) Cables.

Where cable is used, each cable shall be secured to the cabinet, cutout box, or meter socket enclosure.

Exception: Cables with entirely nonmetallic sheaths shall be permitted to enter the top of a surface-mounted enclosure through one or more nonflexible raceways not less than 450 mm (18 in.) and not more than 3.0 m (10 ft) in length, provided all of the following conditions are met:

(1) Each cable is fastened within 300 mm (12 in.), measured along the sheath, of the outer end of the raceway.

(2) The raceway extends directly above the enclosure and does not penetrate a structural ceiling.

(3) A fitting is provided on each end of the raceway to protect the cable(s) from abrasion and the fittings remain accessible after installation.

(4) The raceway is sealed or plugged at the outer end using approved means so as to prevent access to the enclosure through the raceway.

(5) The cable sheath is continuous through the raceway and extends into the enclosure beyond the fitting not less than 6 mm (\(\frac{1}{4}\) in.).

(6) The raceway is fastened at its outer end and at other points in accordance with the applicable article.

(7) Where installed as conduit or tubing, the cable fill does not exceed the amount that would be permitted for complete conduit or tubing systems by Table 1 of Chapter 9 of this Code and all applicable notes thereto. Note 2 to the tables in Chapter 9, Table 1, Note 2 does not apply to this condition.

Informational Note: See Table 1 in Chapter 9, including Note 9, for allowable cable fill in circular raceways. See 310.15(B)(3) (a) for required ampacity reductions for multiple cables installed in a common raceway.

Committee Statement

Committee Statement: CMP 9 agrees with the concept that the referenced notes apply to the tables generally, and not just to Table 1. This wording accomplishes the objectives of the submitter, but flows better editorially.

Response Message:

Public Comment No. 376-NFPA 70-2015 [Section No. 312.5(C)]

The notes in Chapter 9, do not apply to Table 1, they apply to the tables contained in Chapter 9.
314.20 Flush-Mounted Installations.

Flush-mounted installations within or behind a surface of concrete, tile, gypsum, plaster, or other noncombustible material, including boxes employing a flush-type cover or faceplate, shall be made so that the front edge of the box, plaster ring, extension ring, or listed extender will not be set back of the finished surface more than 6 mm (\(\frac{1}{4}\) in.).

For installations within a surface of wood or other combustible surface material, boxes, plaster rings, extension rings, or listed extenders shall extend to the finished surface or project therefrom.

Committee Statement

Committee Statement: CMP 9 agrees that the two paragraphs should use parallel wording. The revision achieves the goal of the submitter, but does so with fewer words. The phrasing “Flush-mounted” need not be duplicated because it occurs verbatim in the section title and therefore applies equally to both paragraphs.

Response Message:

Public Comment No. 377-NFPA 70-2015 [Section No. 314.20]

Have both conditions use the same intro text, the revised wording is now confusing.
Second Revision No. 2405-NFPA 70-2015 [Section No. 314.23(B)(1)]

(1) Nails and Screws.

Nails and screws, where used as a fastening means, shall secure boxes by using brackets on the outside of the enclosure, or through holes provided by the enclosure manufacturer in the back or a single side of the enclosure, or by using mounting holes in the back or in a single side of the enclosure, or they shall pass through the interior within 6 mm (1/4 in.) of the back or ends of the enclosure. Screws shall not be permitted to pass through the box unless exposed threads in the box are protected using approved means to avoid abrasion of conductor insulation. Mounting holes made in the field shall be approved.

Supplemental Information

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Committee Statement

Committee Statement: The PC submittal correctly restated the relevant comments in the voting, which in turn correctly stated the actual panel action on FR 2410. The action and statement included incorrect text. The correct wording of the statement is as follows:

"This revision corrects the previous text that literally required only the nails and screws to be attached instead of the box, and assures that mounting holes are indeed permitted in the back or sides of a box, correcting previous oversights. The new wording also assures that if such holes are made in the field they are subject to the evaluation of the AHJ as to suitability. This is of particular importance in the case of nonmetallic boxes, where such holes are generally discouraged by manufacturers. Mounting holes drilled in steel boxes are less critical but should still be reviewable and the text in this revision provides for both."

The Correlating Committee correctly flagged these errors in their Comment 1792, but did not provide the corrected text. This action in concert with Comment 830 provides both the correct Code text as well as a panel statement that properly aligns with and supports the revised text. Note that the legislative text in Comment 830 shows changes from the first draft text (as is required under the rules at this stage), and not from the 2014 NEC. For the benefit of members of the public who will be reviewing the second draft document, the attached word document shows the resulting changes from the 2014 edition.

Response Message:

Public Comment No. 1792-NFPA 70-2015 [Section No. 314.23(B)(1)]
The Correlating Committee directs the panel to give further consideration to the comments expressed in voting on FR 2410.

Public Comment No. 830-NFPA 70-2015 [Section No. 314.23(B)(1)]
Second Revision No. 2701-NFPA 70-2015 [Section No. 240.24(A)]

(A) Accessibility.

Switches containing fuses, and circuit breakers shall be readily accessible and installed so that the center of the grip of the operating handle of the switch or circuit breaker, when in its highest position, is not more than 2.0 m (6 ft 7 in.) above the floor or working platform, unless one of the following applies:

1. For busways, as provided in 368.17(C).
2. For supplementary overcurrent protection, as described in 240.10.
3. For overcurrent devices, as described in 225.40 and 230.92.
4. For overcurrent devices adjacent to utilization equipment that they supply, access shall be permitted to be by portable means.

**Exception:** The use of a tool shall be permitted to access overcurrent devices located within listed industrial control panels or similar enclosures.

Committee Statement

**Committee:** The word "devices" is removed to improve the readability of the requirement, without changing the intent.

**Response Message:**

Public Comment No. 1765-NFPA 70-2015 [Section No. 240.24(A)]
The Correlating Committee directs that this First Revision be rewritten to comply with the NEC Style Manual relative to the term "devices" to meet the intent of this First Revision.

Public Comment No. 1385-NFPA 70-2015 [Section No. 240.24(A)]
The word "devices" is removed to improve the readability of the requirement, without changing the intent.
210.7  Multiple Branch Circuits.

Where two or more branch circuits supply devices or equipment on the same yoke or mounting strap, a means to simultaneously disconnect the ungrounded supply conductors supplying those devices or equipment shall be provided at the point at which the branch circuits originate.

Committee Statement

Committee Statement:  This revision removes the redundant reference to "devices and equipment."

Response Message:

Public Comment No. 1750-NFPA 70-2015 [Section No. 210.7]
The Correlating Committee directs that further consideration be given to the comments expressed in voting on FR 319.

Public Comment No. 882-NFPA 70-2015 [Section No. 210.7]
The opening part of the paragraph already identifies the requirement is to simultaneously disconnect the ungrounded conductors for devices or equipment. The proposed editorial revision removes the redundant reference to "devices and equipment."

Affirmative with Comment
Coluccio, Frank
I agree with the panel
(2) Wall Space.

As used in this section, a wall space shall include the following:

1. Any space 600 mm (2 ft) or more in width (including space measured around corners) and unbroken along the floor line by doorways and similar openings, fireplaces, and fixed cabinets that do not have countertops or similar work surfaces.

2. The space occupied by fixed panels in walls, excluding sliding panels.

3. The space afforded by fixed room dividers, such as freestanding bar-type counters or railings.

(3) Floor Receptacles.

Receptacle outlets in or on floors shall not be counted as part of the required number of receptacle outlets unless located within 450 mm (18 in.) of the wall.

(4) Countertop Receptacles and Similar Work Surface Receptacle Outlets.

Receptacles installed for countertop and similar work surfaces as specified in 210.52(C) shall not be considered as the receptacles outlets required by 210.52(A).

Committee Statement

Committee: The addition of “similar work surfaces” was made to provide clarity and inclusion of these types of surfaces that may also be found in the areas identified in 210.52(A) in addition to countertops, as being counted as wall space.

Statement of Problem and Substantiation for Public Comment

To correlate with 210.52(C)(5). First Revision FR 308 to 210.52(C)(5) raised the issue of installation of receptacles in work surfaces by revising the Information Note to additionally include work surfaces. The Committee Statement for First Revision FR324 nonetheless makes it clear that the intent is not to address kitchen countertops alone. Consequently, 210.52(C)(5), 210.52(A)(2), 210.52(A)(4), and 210.52(C) need to include requirements for receptacles outlets in work surfaces.

Statement of Problem and Substantiation for Public Comment

To avoid confusion and misinterpretations, and improve readability of the Code. First Revision FR 308 to 210.52(C)(5) raised the issue of installation of receptacles in work surfaces by revising the Information Note to additionally include work surfaces. The Committee Statement for First Revision FR324 nonetheless makes it clear that the intent is not to address kitchen countertops alone. Consequently, 210.52(C)(5), 210.52(A)(2), 210.52(A)(4), and 210.52(C) need to include requirements for receptacles outlets in work surfaces.

Negative with Comment

Coluccio, Frank
Adding the wording "similar work spaces" does not add further clarity to these sections and can create confusion for enforcement when performing inspections.

I do not agree that adding the text "similar work surfaces" adds clarity as it not defined anywhere in the NEC. What is a similar work surface? Additionally, by adding similar work surfaces to 210.52(A)(4) the receptacle outlets installed above a fixed desk top that happens to be located in a kitchen or dining area will not qualify as the receptacle outlets required by 210.52(A). No substantiation was submitted to restrict those receptacle outlets from qualifying under 210.52(A).
(1) Receptacle Outlets Served.

In the kitchen, pantry, breakfast room, dining room, or similar area of a dwelling unit, the two or more 20-ampere small-appliance branch circuits required by 210.11(C)(1) shall serve all wall and floor receptacle outlets covered by 210.52(A), all countertop outlets covered by 210.52(C), and receptacle outlets for refrigeration equipment.

Exception No. 1: In addition to the required receptacles specified by 210.52, switched receptacles supplied from a general-purpose branch circuit as defined in 210.70(A)(1), Exception No. 1, shall be permitted.

Exception No. 2: The receptacle outlet for refrigeration equipment In addition to the required receptacles specified by 210.52, a receptacle outlet to serve a specific appliance shall be permitted to be supplied from an individual branch circuit rated 15 amperes or greater.

Committee Statement

Committee Statement: This change made to Exception No. 2 recognizes that an individual branch circuit supplied specifically for any single appliance is allowed to be a 15-ampere receptacle outlet.

Response Message:

Statement of Problem and Substantiation for Public Comment

Apparently the Panel failed in the substantiation to notice their response was contradicted by Exception No. 3 in this same Section. The Exception for refrigerators was added to allow the 15-ampere outlet and not to be bound by the small appliance circuit receptacle rule. Certain appliances are installed on dedicated circuits by cord and plug connections in the kitchen area regularly. The refrigerator Exception is the only permitted non-small appliance circuit supplied now for other appliances. There is no link stating that the individual branch circuit may be permitted as an Exception, as they have indicated.
(C) Countertops and Work Surfaces.

In kitchens, pantries, breakfast rooms, dining rooms, and similar areas of dwelling units, receptacle outlets for countertop and work surfaces spaces shall be installed in accordance with 210.52(C)(1) through (C)(5).

(1) Wall Countertop and Work Surface Spaces.

A receptacle outlet shall be installed at each wall countertop and work surface space that is 300 mm (12 in.) or wider. Receptacle outlets shall be installed so that no point along the wall line is more than 600 mm (24 in.) measured horizontally from a receptacle outlet in that space.

Exception: Receptacle outlets shall not be required on a wall directly behind a range, counter-mounted cooking unit, or sink in the installation described in Figure 210.52(C)(1).

Figure 210.52(C)(1) Determination of Area Behind a Range, or Counter-Mounted Cooking Unit, or Sink.

(2) Island Countertop Spaces.

At least one receptacle shall be installed at each island countertop space with a long dimension of 600 mm (24 in.) or greater and a short dimension of 300 mm (12 in.) or greater.

(3) Peninsular Countertop Spaces.

At least one receptacle outlet shall be installed at each peninsular countertop long dimension space with a long dimension of 600 mm (24 in.) or greater and a short dimension of 300 mm (12 in.) or greater. A peninsular countertop is measured from the connected perpendicular wall.

A receptacle in a wall countertop space shall be permitted to serve as the receptacle for a peninsular countertop space where the spaces are contiguous and the receptacle is located within 1.8 m (6 ft) of the outside edge of the peninsular countertop.

(4) Separate Spaces.

Countertop spaces separated by rangetops, refrigerators, or sinks shall be considered as separate countertop spaces in applying the requirements of 210.52(C)(1). If a range, counter-mounted cooking unit, or sink is installed in an island or peninsular countertop and the depth of the countertop behind the range, counter-mounted cooking unit, or sink is less than 300 mm (12 in.), the range, counter-mounted cooking unit, or sink shall be considered to divide the countertop space into two separate countertop spaces. Each separate countertop space shall comply with the applicable requirements in 210.52(C).

(5) Receptacle Outlet Location.

Receptacle outlets shall be located on or above, but not more than 500 mm (20 in.) above, the countertop or work surface. Receptacle outlet assemblies listed for use in countertops or work surfaces shall be permitted to be installed in countertops or work surfaces. Receptacle outlets rendered not readily accessible by appliances fastened in place, appliance garages, sinks, or rangetops as covered in 210.52(C)(1). Exception, or appliances occupying dedicated space shall not be considered as these required outlets.

Informational Note: See 406.5(E) and 406.5(G) for requirements for installation of receptacles in countertops and 406.5(F) and 406.5(G) for requirements for installation of receptacles in work surfaces.
Exception to (5): To comply with the following conditions specified in (1) or (2), receptacle outlets shall be permitted to be mounted not more than 300 mm (12 in.) below the countertop or work surface. Receptacles mounted below a countertop or work surface in accordance with this exception shall not be located where the countertop or work surface extends more than 150 mm (6 in.) beyond its support base.

(1) Construction for the physically impaired  
(2) On island and peninsular countertops or work surface where the countertop surface is flat across its entire surface (no backsplashes, dividers, etc.) and there are no means to mount a receptacle within 500 mm (20 in.) above the countertop or work surface, such as an overhead cabinet

Committee Statement

Committee Statement: This action correlates the use of the phrase "work surface" rather than the inconsistent introduction of the term "workspace."

Committee Comment No. 309-NFPA 70-2015 [Section No. 210.52(C)]

This was a Second Revision that has been modified or deleted as the result of Second Correlating Revision: SCR-67-NFPA 70-2016
(D) Bathrooms.

At least one receptacle outlet shall be installed in bathrooms within 900 mm (3 ft) of the outside edge of each basin. The receptacle outlet shall be located on a wall or partition that is adjacent to the basin or basin countertop, located on the countertop, or installed on the side or face of the basin cabinet. In no case shall the receptacle be located more than 300 mm (12 in.) below the top of the basin or basin countertop. Receptacle outlet assemblies listed for the application use in countertops shall be permitted to be installed in the countertop.

Informational Note: See 406.5(E) and 406.5(G) for requirements for installation of receptacles in countertops.

Committee Statement

Committee Statement:

For clarity, "listed for the application" was replaced with "listed for use in countertops".

The addition of 406.5(G) in the informational note correlates with changes made in the First Revision for requirements that were separated into a new 406.5(G)

Response Message:

Statement of Problem and Substantiation for Public Comment

"Listed for the application" is considered to be a vague and unenforceable term per the NEC® Style Manual Clause 3.2.1. The First Revision FR 308 to 210.52(C)(5) revised “Receptacle outlet assemblies listed for the application …” to “Receptacle outlet assemblies listed for use in countertops …”. FR 309 should similarly revise 210.52(D), for consistency. BUT … 210.52(D) is intended to specify the LOCATION of REQUIRED countertop receptacle outlets, not the TYPE of eligible receptacles or receptacle assemblies ALREADY covered in 406.5(E) in 2014 NEC® [First Revision FR5108 divides that 406.5(E) into 406.5(E), (F) and (G) and renumeres the remainder for the 2017 NEC®]. The Informational Note already directs the reader to 406.5(E); that Information Note, however, DOES need to be correlated with FR 5108 for the requirements now separated off into NEW 406.5(G). The third sentence of the mandatory requirement is nonetheless redundant to the mandatory requirement of referenced 406.5(E) and should therefore be deleted. Additionally, FR 309 shows a sentence-case “At” being added to the start of this requirement but did not delete the lowercase “at”, resulting in “At at …”.

Statement of Problem and Substantiation for Public Comment

The First Revision FR 308 to 210.52(C)(5) revised “Receptacle outlet assemblies listed for the application …” to “Receptacle outlet assemblies listed for use in countertops …”. Similarly, FR 309 to 210.52(D) should make the same revision for consistency.
### Second Revision No. 316-NFPA 70-2015 [ Section No. 210.8(A) ]

(A) Dwelling Units.

All 125- and 250-volt, single-phase, 15- and 20-ampere receptacles installed in the locations specified in 210.8(A) (1) through (10) shall have ground-fault circuit-interrupter protection for personnel.

1. **Bathrooms**

2. **Garages, and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use**

3. **Outdoors**

   **Exception to (3): Receptacles that are not readily accessible and are supplied by a branch circuit dedicated to electric snow-melting, deicing, or pipeline and vessel heating equipment shall be permitted to be installed in accordance with 426.28 or 427.22, as applicable.**

4. **Crawl spaces — at or below grade level**

5. **Unfinished basements — for purposes of this section, unfinished basements are defined as portions or areas of the basement not intended as habitable rooms**

   **Exception to (5): A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.**

   **Informational Note:** See 760.41(B) and 760.121(B) for power supply requirements for fire alarm systems.

   Receptacles installed under the exception to 210.8(A) (5) shall not be considered as meeting the requirements of 210.52(G).

6. **Kitchens — where the receptacles are installed to serve the countertop surfaces**

7. **Sinks — where receptacles are installed within 1.8 m (6 ft) of from the outside top inside edge of the bowl of the sink**

8. **Boathouses**

9. **Bathtubs or shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall**

10. **Laundry areas**

### Committee Statement

**Committee Statement:** The requirement for 250 volt ground fault protection was deleted because there was insufficient substantiation to support expanding the requirement to these circuits.

The text regarding unfinished basements has been revised such that a definition for unfinished basements is unnecessary.
The text regarding sinks has been revised to clarify how the measurement is made.

Response

Message:

Public Comment No. 598-NFPA 70-2015 [Section No. 210.8(A)]
This is a three dimensional product INSIDE, OUTSIDE TOP AND BOTTOM, it should be clear the measurement is taken from the top of the sink. Some stone sinks and free standing sinks are completely exposed and in the case of a drop in sink the outside edge could mean the bottom. If the top inside is reference it would be clearer, the measurement starts on the top of the sink along the inside edge of the bowl.

Public Comment No. 623-NFPA 70-2015 [Section No. 210.8(A)]
IEC’s position is to delete the requirement for 250 volt GFCI protection in 210.8(A) - (FR 346)
The submitter of PI 516 was concerned about portable power tools and identified tools such as air compressors, chop saws, and table saws. For residential applications these tools are typically 120 volt and already covered by current Code requirements. If 250 volt tools are utilized in a dwelling unit then the GFCI protection should be located in the article covering the specific equipment. There is no significant substantiation to expand GFCI protection to 250-volt, single phase, 15- and 20-ampere receptacles in dwelling units.

Public Comment No. 1060-NFPA 70-2015 [Section No. 210.8(A)]
This comment would seek to return the parent text of 210.8(A) to the original text at 210.8(A) of the 2014 NEC. Where is the substantiation for including 250-volt receptacles in required GFCI protection? No one is more supportive and committed to GFCI protection than the submitter of this comment, but I don’t see the required substantiation for this increase. In the Public Input that spurred this proposed change (PI 516), the submitter made a statement about 250 volt air compressors, chop saws, table saws etc. that are widely used in residential areas that see potential hazards from ground faults. This is a statement, not substantiated evidence of these alleged ground faults. Speaking as an experienced woodworker, the 250 volt air compressors chop saws, and table saws that I encounter (especially at dwelling units) are also rated at 30-ampere or greater. If these tools addressed in the public input are rated at 250-volts, they typically would not be covered by these GFCI requirements as they are typically plugged into a 30-ampere rated receptacle (not requiring GFCI protection). Even as currently proposed by FR 346, 210.8(A) would only apply to 15- and 20-ampere rated receptacles. The proposed change would increase the voltage rating, not the ampere rating of the receptacle. A quick fix to this would be for CMP-2 to simply raise both the voltage rating (to 250 volts) and the ampere rating (to 30 ampere) for the receptacle involved, but once again I ask, where is the substantiation? If the ampere rating were to be increased for GFCI protection, this would encompass such things as the clothes dryer receptacle. Where is the substantiation for a 250-volt, 30-ampere rated clothes dryer to be GFCI protected? If this section remains as proposed, it will be very difficult for an AHJ to explain why a 250-volt, 20-ampere rated receptacle does required GFCI protection and a 250-volt, 30-ampere rated receptacle does not require GFCI protection.

Public Comment No. 884-NFPA 70-2015 [Section No. 210.8(A)]
The text defining unfinished basements in 210.8(A)(5) was relocated to a new 210.2 for consistency within 210 and the NEC in general. Removing the text “storage areas, work areas, and the like” from 210.8(A)(5) and expanding the GFCI requirements in 210.8(B) to include unfinished basements identifies sufficient substantiation to define the term for the purposes of the article. This can be accomplished by locating the definition in the now available 210.2. A companion comment has been submitted to include the definition in a new 210.2. The words “or spaces” will be added to the new definition in 210.2 for clarification. As worded in 201.8(A)(5) in First Draft, the reference to open areas in basements has been lost. This will present enforcement challenges for example; how would a habitable space within a basement that has not been finished as a “room” be treated? If the defining the term in a new 210.2 is not accepted
the words “or spaces” should be added to 210.8(A)(5) so it reads; .... habitable rooms or spaces.

Public Comment No. 545-NFPA 70-2015 [Section No. 210.8(A)]
Contrary to the panel statement this section was amended by other PI's to include 250v circuits, however it neglected to act on the ampacity of the circuit as addressed in PI 2803. The notion that a 25 ampere circuit is less dangerous than a 20 ampere circuit have been dismissed, pool pump motors are a good example of this. when deciding to require 250v GFCI protection for the pool pumps the panel recognized ampere capacity whether 20 amps or 25 amps had no bearing. Please reconsider the ampacity limitation as a 220v 20 amp compressor next to a sink is no different than a 220v 25 amp compressor. The panel recognized this hazard in the 2017 NEC section 210.8 (B). I would hope the same safety concerns are given to homeowner. As far as the voltage is concerned the Panel should consider larger home that have 208/120 three phase services and amend the language to 120 through 250volts.

Affirmative with Comment
Coluccio, Frank
There is lack of substantiation to include 3 phase receptacle outlets up to 100 amps and single phase receptacle outlets up to 50 amps

Hilbert, Mark R.
I am voting affirmative as I agree with removing the reference to 250 volt single phase 15 and 20 ampere receptacle outlets in 210.8(A) and with the revision of the text regarding unfinished basements in 210.8(A)(5). The substantiation to raise the voltage level to 250 volts in the First Draft was insufficient and the revisions to 210.8(A)(5) add clarity by removing unnecessary text. I do not agree the exception for rooftops is necessary or that it adds clarity to the section. The receptacle on the rooftop is provided for servicing of equipment on the rooftop and therefore only has to be readily accessible to those who would be servicing the equipment on the rooftop. I agree with the changes in 210.8(A)(7) to clarify the measurements from a sink are from the top of the sink. However, I do not agree with making the measurement only from the bowl of the sink. The measurement method now overlooks the basic reason for the original requirement which was related to being able to contact a conductive surface associated with a sink and the conductive surface of an appliance supplied from a receptacle outlet for the countertop wall space at the same time. In fact the photo of the stainless steel sink and its contiguous drying area/work surface submitted with the public comment depicts the exact reason why measuring from the sink bowl only is a problem. Assuming the stainless steel sink is attached to some type of conductive water or drain piping that is grounded, why would the contiguous conductive drying/work surface portion which poses exactly the same hazard as the conductive sink bowl now be overlooked? I did not vote negative as the other changes have greater merit and most piping attached to dwelling unit sinks today is nonmetallic. In my opinion, the text referencing the bowl of the sink and the exception for rooftop receptacle outlets should be removed for the 2020 NEC.
(E) Crawl Space Lighting Outlets.
GFCI protection shall be provided for lighting outlets not exceeding 120 volts installed in crawl spaces.

Committee Statement

Committee Statement: GFCI protection for crawl space lighting outlets has been relocated from 210.70(C) as it deals with personnel protection from electrical shock and is thus more appropriately located in this section.

Response Message:

Affirmative with Comment
Coluccio, Frank
I agree with the panel
Hilbert, Mark R.
I support adding this requirement but it may need to be renumbered as 210.8(C) if dishwashers and boat hoists are not included as 210.8(C) and (D).
(E) Crawl Space Lighting Outlets.

GFCI protection shall be provided for lighting outlets not exceeding 120 volts installed in crawl spaces.

Committee Statement

Committee: GFCI protection for crawl space lighting outlets has been relocated from 210.70(C) as it deals with personnel protection from electrical shock and is thus more appropriately located in this section.
Second Revision No. 320-NFPA 70-2015 [Section No. 210.12(B)]

(B) Dormitory Units.

All 120-volt, single-phase, 15- and 20-ampere branch circuits supplying outlets and devices installed in dormitory unit bedrooms, living rooms, hallways, closets, bathrooms, and similar rooms shall be protected by a listed arc-fault circuit interrupter meeting the requirements of any of the means described in 210.12(A)(1) through (6) as appropriate.

Committee Statement

Committee Statement: "As appropriate" is a vague and unenforceable term. It has been deleted in accordance with NEC Style Manual Section 3.2.1. As previously worded, the arc-fault circuit-interrupter could be required to meet all of the requirements of 210.12(A)(1) through 210.12(A)(6). Revised wording matches how 210.12(A) expresses the same.

Response Message:

Public Comment No. 36-NFPA 70-2015 [Section No. 210.12(B)]
Whereas the need for AFCI protection has been satisfactorily demonstrated, expanding its application throughout the dormitory unit is consistent with the companion change proposed in 210.12(A).

Public Comment No. 1752-NFPA 70-2015 [Section No. 210.12(C)]
The Correlating Committee directs that section 210.12(D) be rewritten with respect to "as appropriate" to comply with the NEC Style Manual.

Public Comment No. 815-NFPA 70-2015 [Section No. 210.12(B)]
"As appropriate" is a vague and unenforceable term. Delete in accordance with NEC® Style Manual 3.2.1. As worded, the arc-fault circuit-interrupter could be required to meet ALL of the requirements of 210.12(A)(1) through 210.12(A)(6). Revise wording to match how 210.12(A) expresses the same. All means in 210.12(A)(1) through 210.12(A)(6) are already specified as being listed; redundant to repeat here.

X

Affirmative with Comment
Coluccio, Frank
I agree with the panel
(B) Dormitory Units.

All 120-volt, single-phase, 15- and 20-ampere branch circuits supplying outlets and devices installed in dormitory unit bedrooms, living rooms, hallways, closets, bathrooms, and similar rooms shall be protected by a listed arc-fault circuit interrupter meeting the requirements of any of the means described in 210.12(A)(1) through (6) as appropriate.

Committee Statement

Committee Statement: "As appropriate" is a vague and unenforceable term. It has been deleted in accordance with NEC® Style Manual Section 3.2.1. As previously worded, the arc-fault circuit-interrupter could be required to meet all of the requirements of 210.12(A)(1) through 210.12(A)(6). Revised wording matches how 210.12(A) expresses the same.

Statement of Problem and Substantiation for Public Comment

Whereas the need for AFCI protection has been satisfactorily demonstrated, expanding its application throughout the dormitory unit is consistent with the companion change proposed in 210.12(A).

The Correlating Committee directs that section 210.12(D) be rewritten with respect to "as appropriate" to comply with the NEC Style Manual.

"As appropriate" is a vague and unenforceable term. Delete in accordance with NEC® Style Manual 3.2.1. As worded, the arc-fault circuit-interrupter could be required to meet ALL of the requirements of 210.12(A)(1) through 210.12(A)(6). Revise wording to match how 210.12(A) expresses the same. All means in 210.12(A)(1) through 210.12(A)(6) are already specified as being listed; redundant to repeat here.
### Second Revision No. 325-NFPA 70-2015 [ Section No. 210.70(A)(2) ]

**Additional Locations.**

Additional lighting outlets shall be installed in accordance with (A)(2)(a), (A)(2)(b), (A)(2)(c), and (A)(2)(d), the following:

1. **At least one wall switch–controlled lighting outlet shall be installed in hallways, stairways, attached garages, and detached garages with electric power.**

2. **For dwelling units, attached garages, and detached garages with electric power, at least one wall switch–controlled lighting outlet shall be installed to provide illumination on the exterior side of outdoor entrances or exits with grade-level access. A vehicle door in a garage shall not be considered as an outdoor entrance or exit.**

3. **Where one or more lighting outlet(s) are installed for interior stairways, there shall be a wall switch at each floor level, and landing level that includes an entryway, to control the lighting outlet(s) where the stairway between floor levels has six risers or more.**

**Exception to (A)(2)(1), (A)(2)(2), and (A)(2)(3): In hallways, in stairways, and at outdoor entrances, remote, central, or automatic control of lighting shall be permitted.**

4. **Outlets supplying lighting for stairs meeting the requirements of Lighting outlets controlled in accordance with 210.70(A)(2)(3) shall not be controlled by use of a dimmer switch unless they provide the full range of dimming control at each location.**

### Committee Statement

**Committee Statement:** Section 210.70(A)(2)(d) has been revised to permit dimmers for outlets supplying lighting for stairs if the full range of dimming control is provided at each switch location. New wording for this section in the First Revision did not address the full range of dimming control at each location.

**Response Message:**

**Affirmative with Comment**

Coluccio, Frank

I agree with the panel
(1) Garages.

In each attached garage and in each detached garage with electric power, the branch circuit supplying this receptacle(s) shall not supply outlets outside of the garage. At least one receptacle outlet shall be installed in each vehicle bay and not more than 1.7 m (5 1/2 ft) above the floor.

Committee Statement

Committee Statement: The language related to outlets outside of the garage has been deleted from this section to correlate with changes made to 210.11(C)(4).

Response Message:

Statement of Problem and Substantiation for Public Comment

There is no adequate substantiation to support that other receptacles should not be allowed on this circuit. Article 210.11(C)(3) will now require this circuit to be a 20 amp circuit. A power tool that draws 16 amps was used as substantiation in the FR. Power tools are seldom used in the average home owner's garage. Hair dryers that draw 16 amps are more likely to be used in bathrooms and at times more than one at the same because of multiple bathrooms. The NEC does not require individual branch circuits to bathrooms.

Statement of Problem and Substantiation for Public Comment

A similar requirement for "no other outlets" is being proposed at 210.11(C)(4). Section 210.52 is requirements for dwelling unit receptacle outlets. A more appropriate location for this text that deals with the branch circuit supplying these receptacle outlets is 210.11(C), which deals with required branch circuits for dwelling units. The proposed deleted text deals with the branch circuit supplying the garage, not the receptacle outlet(s) itself.

Statement of Problem and Substantiation for Public Comment

Although the exception will restore the option to supply outdoor receptacle outlets on the garage from the required branch circuit inside of the garage, the revised wording will restrict lighting or other receptacle outlets from being supplied. The revised text "shall not supply other outlets" is consistent with other language in 210 restricting the use of branch circuits. Additionally, CMP 2 created a minimum requirement of 20 amperes for the garage branch circuit as a means of recognizing the increased use of the circuit for the First Draft. The requirements for the EV charging circuit are not considered by this section as the last sentence of 210.52(G) specifies the required receptacle(s) is in addition to those installed for specific equipment. The type of circuit required for EV charging will be addressed in 625 and/or the manufactures installation instructions for the equipment.
(1) Garages.

In each attached garage and in each detached garage with electric power, the branch circuit supplying this receptacle(s) shall not supply outlets outside of the garage. At least one receptacle outlet shall be installed in each vehicle bay and not more than 1.7 m (5 1/2 ft) above the floor.

Committee Statement

Committee Statement: The language related to outlets outside of the garage has been deleted from this section to correlate with changes made to 210.11(C)(4).

Response Message:

Public Comment No. 1549-NFPA 70-2015 [Section No. 210.52(G)(1)]
There is no adequate substantiation to support that other receptacles should not be allowed on this circuit. Article 210.11(C)(3) will now require this circuit to be a 20 amp circuit. A power tool that draws 16 amps was used as substantiation in the FR. Power tools are seldom used in the average home owners garage. Hair dryers that draw 16 amps are more likely to be used in bathrooms and at times more than one at the same because of multiple bathrooms. The NEC does not require individual branch circuits to bathrooms.

Public Comment No. 954-NFPA 70-2015 [Section No. 210.52(G)(1)]
A similar requirement for “no other outlets” is being proposed at 210.11(C)(4). Section 210.52 is requirements for dwelling unit receptacle outlets. A more appropriate location for this text that deals with the branch circuit supplying these receptacle outlets is 210.11(C), which deals with required branch circuits for dwelling units. The proposed deleted text deals with the branch circuit supplying the garage, not the receptacle outlet(s) itself.

Public Comment No. 929-NFPA 70-2015 [Section No. 210.52(G)(1)]
Although the exception will restore the option to supply outdoor receptacle outlets on the garage from the required branch circuit inside of the garage, the revised wording will restrict lighting or other receptacle outlets from being supplied. The revised text “shall not supply other outlets” is consistent with other language in 210 restricting the use of branch circuits. Additionally, CMP 2 created a minimum requirement of 20 amperes for the garage branch circuit as a means of recognizing the increased use of the circuit for the First Draft. The requirements for the EV charging circuit are not considered by this section as the last sentence of 210.52(G) specifies the required receptacle(s) is in addition to those installed for specific equipment. The type of circuit required for EV charging will be addressed in 625 and/or the manufactures installation instructions for the equipment.

Affirmative with Comment

Coluccio, Frank

I agree with the panel
(2) Built-in Dishwashers and Trash Compactors.

Built-in dishwashers and trash compactors shall be permitted to be cord-and-plug-connected with a flexible cord identified as suitable for the purpose in the installation instructions of the appliance manufacturer where all of the following conditions are met:

(1) The flexible cord shall be terminated with a grounding-type attachment plug.

Exception: A listed dishwasher or trash compactor distinctly marked to identify it as protected by a system of double insulation, or its equivalent, shall not be required to be terminated with a grounding-type attachment plug.

(2) For a trash compactor, the length of the cord shall be 0.9 m to 1.2 m (3 ft to 4 ft) measured from the face of the attachment plug to the plane of the rear of the appliance.

(3) For a built-in dishwasher, the length of the cord shall be 0.9 m to 2.0 m (3 ft to 6.5 ft) measured from the face of the attachment plug to the plane of the rear of the appliance.

(4) Receptacles shall be located to protect against physical damage to the flexible cord.

(5) The receptacle for a trash compactor shall be located in the space occupied by the appliance or adjacent thereto.

(6) The receptacle for a built-in dishwasher shall be located in the space adjacent to the space occupied by the dishwasher.

(7) The receptacle shall be accessible.

Committee Statement

Committee Statement: In the context of dishwashers or trash compactors, it is unclear in the exception what the equivalent to double insulation is. Since these appliances may either be protected by grounding or double insulation, the “or its equivalent” statement in the requirement could be deleted without affecting product design and to also avoid confusion.

Response Message:

Statement of Problem and Substantiation for Public Comment

In the context of dishwashers or trash compactors, it is unclear in the exception what the equivalent to double insulation is. Since these appliances may either be protected by grounding or double insulation, the “or its equivalent” statement in the requirement could be deleted without affecting product design and to also avoid confusion.
Range hoods shall be permitted to be cord-and-plug-connected with a flexible cord identified as suitable for use on range hoods in the installation instructions of the appliance manufacturer, where all of the following conditions are met:

1. The flexible cord is terminated with a grounding-type attachment plug.
   
   **Exception:** A listed range hood distinctly marked to identify it as protected by a system of double insulation, or its equivalent, shall not be required to be terminated with a grounding-type attachment plug.

2. The length of the cord is not less than 450 mm (18 in.) and not over 1.2 m (4 ft).

3. Receptacles are located to protect against physical damage to the flexible cord.

4. The receptacle is accessible.

5. The receptacle is supplied by an individual branch circuit.

### Committee Statement

**Committee Statement:** In the context of range hoods it is unclear in the exception what the equivalent to double insulation is. Since these appliances may either be protected by grounding or double insulation, the "or its equivalent" statement in the requirement could be deleted without affecting product design and to also avoid confusion.

**Response Message:**

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

In the context of range hoods it is unclear in the exception what the equivalent to double insulation is. Since these appliances may either be protected by grounding or double insulation, the "or its equivalent" statement in the requirement could be deleted without affecting product design and to also avoid confusion.
422.18 Support of Ceiling-Suspended (Paddle) Fans.

Ceiling-suspended (paddle) fans shall be supported independently of an outlet box or by one of the following:

1. A listed outlet box system identified for the use and installed in accordance with 314.27(C).

2. A listed outlet box system, a listed locking support and mounting receptacle, and a compatible factory installed attachment fitting designed for support, identified for the use and installed in accordance with 314.27(E).

Committee Statement

The Panel agrees to adding reference to the listed device and compatible factory installed attachment fitting noting that this is predicated on Panel 9 retaining its complementary First Revision (the new 314.27(E)). Made editorial revisions for clarity.

Response Message:

Statement of Problem and Substantiation for Public Comment

The text was editorially modified to be a list, and only item (3) was added as new text. This proposed text is not considered “new material” because it is added to coordinate with new text in 314.27(E) proposed and approved by CMP 9 in FR 2411 that reads as follows: (E) Separable Attachment Fittings. Outlet boxes shall be permitted to support listed locking support and mounting receptacles used in combination with compatible attachment fittings designed for the support of equipment covered within and subject to all weight and orientation limits contemplated by the listing. Where such fittings are used, the equipment mounted shall comply with 314.27(A) through (D) as applicable. Where the supporting receptacle is installed within a box, it shall be included in the fill calculation covered in 314.16(B)(4).
(A) Damp Locations.

A receptacle installed outdoors in a location protected from the weather or in other damp locations shall have an enclosure for the receptacle that is weatherproof when the receptacle is covered (attachment plug cap not inserted and receptacle covers closed).

An installation suitable for wet locations shall also be considered suitable for damp locations.

A receptacle shall be considered to be in a location protected from the weather where located under roofed open porches, canopies, marquees, and the like, and will not be subjected to a beating rain or water runoff. All 15- and 20-ampere, 125- and 250-volt nonlocking receptacles shall be a listed weather-resistant type.

Informational Note: The types of receptacles covered by this requirement are identified as 5-15, 5-20, 6-15, and 6-20 in ANSI/NEMA WD 6-2002, National Electrical Manufacturers Association, Standard for Dimensions of Attachment Plugs and Receptacles 6–2012, Wiring Devices — Dimensional Specifications.

Committee Statement

Committee Statement: Panel 12: Reject but See SR No. 3318


Panel 19: CMP 19 advises an accept of PC 120 to make the change to the reference.

Response Message:

Statement of Problem and Substantiation for Public Comment

Same standard with new title.
(1) Receptacles of 15 and 20 Amperes in a Wet Location.

Receptacles of 15 and 20 amperes, 125 and 250 volts installed in a wet location shall have an enclosure that is weatherproof whether or not the attachment plug cap is inserted. An outlet box hood installed for this purpose shall be listed and shall be identified as “extra-duty.” Other listed products, enclosures, or assemblies providing weatherproof protection that do not utilize an outlet box hood need not be marked “extra duty.”

Informational Note No. 1: Requirements for extra-duty outlet box hoods are found in ANSI/UL 514D–2013, Cover Plates for Flush-Mounted Wiring Devices. “Extra duty” identification and requirements are not applicable to listed receptacles, faceplates, outlet boxes, enclosures, or assemblies that are identified as either being suitable for wet locations or as rated as one of the outdoor enclosure-type numbers of Table 110.28 that does not utilize an outlet box hood.

Exception: 15- and 20-ampere, 125- through 250-volt receptacles installed in a wet location and subject to routine high-pressure spray washing shall be permitted to have an enclosure that is weatherproof when the attachment plug is removed.

All 15- and 20-ampere, 125- and 250-volt nonlocking-type receptacles shall be listed and so identified as the weather-resistant type.

Informational Note No. 2: The configuration of weather-resistant receptacles covered by this requirement are identified as 5-15, 5-20, 6-15, and 6-20 in ANSI/NEMA WD 6–2002, Standard for Dimensions of Attachment Plugs and Receptacles 6–2012, Wiring Devices — Dimensional Specifications.

Committee Statement

Committee Statement: Change reference to correct edition.
406.5 Receptacle Mounting.

Receptacles shall be mounted in identified boxes or assemblies. The boxes or assemblies shall be securely fastened in place unless otherwise permitted elsewhere in this Code. Screws used for the purpose of attaching receptacles to a box shall be of the type provided with a listed receptacle, or shall be machine screws having 32 threads per inch or part of listed assemblies or systems, in accordance with the manufacturer's instructions.

(A) Boxes That Are Set Back.

Receptacles mounted in boxes that are set back from the finished surface as permitted in 314.20 shall be installed such that the mounting yoke or strap of the receptacle is held rigidly at the finished surface.

(B) Boxes That Are Flush.

Receptacles mounted in boxes that are flush with the finished surface or project therefrom shall be installed such that the mounting yoke or strap of the receptacle is held rigidly against the box or box cover.

(C) Receptacles Mounted on Covers.

Receptacles mounted to and supported by a cover shall be held rigidly against the cover by more than one screw or shall be a device assembly or box cover listed and identified for securing by a single screw.

(D) Position of Receptacle Faces.

After installation, receptacle faces shall be flush with or project from faceplates of insulating material and shall project a minimum of 0.4 mm (0.015 in.) from metal faceplates.

Exception: Listed kits or assemblies encompassing receptacles and nonmetallic faceplates that cover the receptacle face, where the plate cannot be installed on any other receptacle, shall be permitted.

(E) Receptacles in Countertops.

Receptacle outlets assemblies for installation in countertop surfaces shall be listed for countertop applications. Where receptacle assemblies for countertop applications are required to provide ground-fault circuit-interrupter protection for personnel in accordance with 210.8, such assemblies shall be permitted to be listed as GFCI receptacle assemblies for countertop applications.

(F) Receptacles in Work Surfaces.

Receptacle outlet assemblies and GFCI receptacle assemblies listed for use in work surfaces or countertop applications shall be permitted to be installed in work surfaces.

(G) Receptacle Orientation.

Receptacles shall not be installed in a face-up position in countertop or on countertop surfaces or work surfaces unless listed for the purpose of countertop or work surface applications.

(H) Receptacles in Seating Areas and Other Similar Surfaces.
In seating areas or similar surfaces, receptacles shall not be installed in a face-up position unless the receptacle is any of the following:

1. Part of an assembly listed as a furniture power distribution unit
2. Part of an assembly listed either as household furnishings or as commercial furnishings
3. Listed either as a receptacle assembly for countertop applications or as a GFCI receptacle assembly for countertop applications
4. Installed in a listed floor box

I. Exposed Terminals.

Receptacles shall be enclosed so that live wiring terminals are not exposed to contact.

J. Voltage Between Adjacent Devices.

A receptacle shall not be grouped or ganged in enclosures with other receptacles, snap switches, or similar devices, unless they are arranged so that the voltage between adjacent devices does not exceed 300 volts, or unless they are installed in enclosures equipped with identified, securely installed barriers between adjacent devices.

Committee Statement

Committee 406.5 (E) and (F) were reworded slightly to clarify that they apply only to horizontally mounted receptacle assemblies and not to assemblies mounted vertically in a counter backsplash. In accordance with NEC® Style Manual 2.1.5.2, titles were added for new subdivisions 406.5(F) and 406.5(G). Subdivision titles should also appear consistently in boldface type. In accordance with NEC® Style Manual 3.2.1, new 406.5(G)’s “for the purpose” is a vague and unenforceable term and has been replaced by “countertop or work surface applications”.

Response Message:

Statement of Problem and Substantiation for Public Comment

There are differences between the terms “receptacle”, “receptacle outlet” and “receptacle assembly”. The Panel is confusing Article 100 Code-defined terms with imprecise commercial vernacular in 406.5(E) and new 406.5(F). Also FR 5108 now uses the terms inconsistently throughout these subsections of 406.5. Compare FR 5108’s new first sentence’s use of “receptacle outlets” with “receptacle assemblies” in the second sentence for 406.5(E), as an example. Compare FR 5108’s use of “receptacle outlets” in 406.5(E) and new 406.5(F) with “receptacle assemblies” in renumbered 406.5(H)(3), as another example. As presently written in FR5108, this imprecise use of terms could be ambiguously misinterpreted that REGULAR receptacles (i.e., “Receptacle outlets”) installed in VERTICAL backsplashes of countertops (i.e., NOT mounted face-up but face-out) would now have to be ADDITIONALLY listed as suitable for countertop applications. This ambiguity would preclude most eligible listed receptacles (installed FACE-OUT on countertop backsplashes) that are presently permitted because those would not be “listed for countertop applications”. In accordance with NEC® Style Manual 2.1.5.2, titles are needed for new subdivisions 406.5(F) and 406.5(G). Subdivision titles should also appear consistently in boldface type. In accordance with NEC® Style Manual 3.2.1, new 406.5(G)’s “for the purpose” is a vague and unenforceable term.
(B) Combustible Low-Density Cellulose Fiberboard.

Where a surface-mounted luminaire containing a ballast, transformer, LED driver, or power supply is to be installed on combustible low-density cellulose fiberboard, it shall be marked for this condition or shall be spaced not less than 38 mm (1 1/2 in.) from the surface of the fiberboard. Where such luminaires are partially or wholly recessed, the provisions of 410.110 through 410.122 shall apply.

Informational Note: Combustible low-density cellulose fiberboard includes sheets, panels, and tiles that have a density of 320 kg/m$^3$ (20 lb/ft$^3$) or less and that are formed of bonded plant fiber material but does not include solid or laminated wood or fiberboard that has a density in excess of 320 kg/m$^3$ (20 lb/ft$^3$) or is a material that has been integrally treated with fire-retarding chemicals to the degree that the flame spread index in any plane of the material will not exceed 25, determined in accordance with tests for surface burning characteristics of building materials. See ANSI/ASTM E84-2014, Test Method for Surface Burning Characteristics of Building Materials - E84–2015a, Standard Test Method for Surface Burning Characteristics of Building Materials or ANSI/UL 723–2013, Standard for Test for Surface Burning Characteristics of Building Materials.

Committee Statement

Committee Statement: Updated ASTM standard to most recent edition. Added UL 723 as this standard is a mirror image of the ASTM standard.

Response Message:

Statement of Problem and Substantiation for Public Comment

Every code cycle the panel updates the reference to ASTM 84 in the Informational Note with the latest revision date. When the panel met in January during the Public Input stage the reference was changed to “ANSI/ASTM E84-2014”. Since January ASTM E84 has been revised twice. The revision history for ASTM E84 shows that it has been revised 16 times since 2010. With this frequency of revisions, any revision mentioned in the code will more than likely be out of date as soon as the 2017 NEC is published. While researching ASTM E84 I came upon a 10-year old UL White Paper that indicates that ASTM E84 and UL 723 are identical. Further research led to the guide-card information for UL category code BIKT which states, “The basic standard used to investigate building products for surface-burning characteristics is ANSI/UL 723, ‘Test for Surface Burning Characteristics of Building Materials.’ The same test method is also covered in ANSI/ASTM E84, ‘Standard Test Method for Surface Burning Characteristics of Building Materials.’ Where surface-burning characteristics are required, many model codes recognize either standard.” Since ASTM E84 and UL 723 are the same I propose changing the reference in the Informational Note of 410.136(B) from ASTM E84 to UL 723 since UL 723 gets revised with less frequency than ASTM E84.

Statement of Problem and Substantiation for Public Comment

Standard date update
(1) Fire-Rated Assemblies.
Wiring located within the cavity of a fire-rated floor-ceiling or roof-ceiling assembly shall not be secured to, or supported by, the ceiling assembly, including the ceiling support wires. An independent means of secure support shall be provided and shall be permitted to be attached to the assembly. Where independent support wires are used, they shall be distinguishable by color, tagging, or other effective means from those that are part of the fire-rated design.

Exception: The ceiling support system shall be permitted to support wiring and equipment that have been tested as part of the fire-rated assembly.

Informational Note: One method of determining fire rating is testing in accordance with ANSI/ASTM E119-2014, Method for Fire Tests of Building Construction and Materials.

Committee Statement

Committee Statement: The ANSI/ASTM E119 has been changed from 2014 to 2015.
Response Message:

Statement of Problem and Substantiation for Public Comment
Referenced correct SDO and updated edition.

Standard date update
725.133 Installation of Conductors and Equipment in Cables, Compartments, Cable Trays, Enclosures, Manholes, Outlet Boxes, Device Boxes, Raceways, and Cable Routing Assemblies for Class 2 and Class 3 Circuits.

Conductors and equipment for Class 2 and Class 3 circuits shall be installed in accordance with 725.135 through 725.143. 725.144.

Committee Statement

Committee Statement: The addition of 725.144 requires modification of 725.133.

Response Message:

This Public Comment is editorial to accommodate adding 725.144 in support of the Public Comment on Public Input 1837. Presently, 725.133 has installation requirements for Class 2/3 circuits. This proposed revision to 725.133 accommodates acceptance of 725.144, which was proposed by Public input 1837.

Affirmative with Comment
Corbin, Adam D.
I agree.
X

Negative with Comment
Brewer, Larry G.
Added words not necessary
725.179  Listing and Marking of Class 2, Class 3, and Type PLTC Cables.

Class 2, Class 3, and Type PLTC cables, installed as wiring methods within buildings, shall be listed as resistant to the spread of fire and other criteria in accordance with 725.179(A) through (H) and shall be marked in accordance with 725.179(J).

(A) Types CL2P and CL3P.

Types CL2P and CL3P plenum cable shall be listed as suitable for use in ducts, plenums, and other space for environmental air and shall be listed as having adequate fire-resistant and low-smoke producing characteristics.

Informational Note: One method of defining a cable that is low-smoke producing and fire resistant is that the cable exhibits a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.52 m (5 ft) or less when tested in accordance with NFPA 262-2015, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.

(B) Types CL2R and CL3R.

Types CL2R and CL3R riser cables shall be marked as Type CL2R or CL3R, respectively, and be listed as suitable for use in a vertical run in a shaft or from floor to floor and shall be listed as having fire-resistant characteristics capable of preventing the carrying of fire from floor to floor.

Informational Note: One method of defining fire-resistant characteristics capable of preventing the carrying of fire from floor to floor is that the cables pass the requirements of ANSI/UL 1666-2012, Test for Flame Propagation Height of Electrical and Optical-Fiber Cable Installed Vertically in Shafts.

(C) Types CL2 and CL3.

Types CL2 and CL3 cables shall be marked as Type CL2 or CL3, respectively, and be listed as suitable for general-purpose use, with the exception of risers, ducts, plenums, and other space used for environmental air, and shall be listed as resistant to the spread of fire.

Informational Note: One method of defining resistant to the spread of fire is that the cables do not spread fire to the top of the tray in the UL flame exposure, vertical tray flame test in ANSI/UL 1685-2010, Standard for Safety for Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables. The smoke measurements in the test method are not applicable. Another method of defining resistant to the spread of fire is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the CSA vertical flame test for—cables in cable trays, as described in CSA C22.2 No. 0.3-M-2001, Test Methods for Electrical Wires and Cables.

(D) Types CL2X and CL3X.

Types CL2X and CL3X limited-use cables shall be marked as Type CL2X or CL3X, and be listed as suitable for use in dwellings and raceways and shall be listed as resistant to flame spread.

Informational Note: One method of determining that cable is resistant to flame spread is by testing the cable to the VW-1 (vertical wire) flame test in ANSI/UL 1581-2011, Reference Standard for Electrical Wires, Cables and Flexible Cords.

(E) Type PLTC.

Type PLTC nonmetallic-sheathed, power-limited tray cable shall be listed as being suitable for cable trays and shall consist of a factory assembly of two or more insulated conductors under a nonmetallic jacket. The insulated conductors shall be 22 AWG through 12 AWG. The conductor material shall be copper (solid or stranded). Insulation on conductors shall be rated for 300 volts. The cable core shall be two or more parallel conductors, one or more group assemblies of twisted or parallel conductors, or a combination thereof. A metallic
shield or a metallized foil shield with drain wire(s) shall be permitted to be applied over the cable core, over groups of conductors, or both. The cable shall be listed as resistant to the spread of fire. The outer jacket shall be a sunlight- and moisture-resistant nonmetallic material. Type PLTC cable used in a wet location shall be listed for use in wet locations or have a moisture-impervious metal sheath.

Exception No. 1: Where a smooth metallic sheath, continuous corrugated metallic sheath, or interlocking tape armor is applied over the nonmetallic jacket, an overall nonmetallic jacket shall not be required. On metallic-sheathed cable without an overall nonmetallic jacket, the information required in 310.120 shall be located on the nonmetallic jacket under the sheath.

Exception No. 2: Conductors in PLTC cables used for Class 2 thermocouple circuits shall be permitted to be any of the materials used for thermocouple extension wire.

Informational Note: One method of defining resistant to the spread of fire is that the cables do not spread fire to the top of the tray in the UL flame exposure, vertical tray flame test in ANSI/UL 1685-2010, Standard for Safety for Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables. The smoke measurements in the test method are not applicable.

Another method of defining resistant to the spread of fire is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the CSA vertical tray flame test for cables in cable trays, as described in CSA C22.2 No. 0.3-M-2001, Test Methods for Electrical Wires and Cables.

(F) Circuit Integrity (CI) Cable or Electrical Circuit Protective System.

Cables that are used for survivability of critical circuits under fire conditions shall meet either 725.179(F)(1) or (F)(2) as follows:

(1) Circuit Integrity (CI) Cables.

Circuit Integrity (CI) cables, specified in 725.179(A), (B), (C), and (E), and used for survivability of critical circuits, shall have the additional classification using the suffix “CI.” Circuit integrity (CI) cables shall only be permitted to be installed in a raceway where specifically listed and marked as part of an electrical circuit protective system as covered in 725.179(F)(2).

(2) Electrical Circuit Protective System.

Cables specified in 725.179(A), (B), (C), (E), and (F)(1) that are part of an electrical circuit protective system shall be identified with the protective system number and hourly rating printed on the outer jacket of the cable and installed in accordance with the listing of the protective system.

Informational Note No. 1: One method of defining circuit integrity (CI) cable or an electrical circuit protective system is by establishing a minimum 2-hour fire-resistive rating when tested in accordance with UL 2196-2012, Standard for Tests of Fire Resistive Cables.

Informational Note No. 2: UL guide information for electrical circuit protective systems (FHIT) contains information on proper installation requirements to maintain the fire rating.

(G) Class 2 and Class 3 Cable Voltage Ratings.

Class 2 cables shall have a voltage rating of not less than 150 volts. Class 3 cables shall have a voltage rating of not less than 300 volts. Class 2 and Class 3 cables shall have a temperature rating of not less than 60°C (140°F).

(H) Class 3 Single Conductors.

Class 3 single conductors used as other wiring within buildings shall not be smaller than 18 AWG and shall be Type CL3. Conductor types described in 725.49(B) that are also listed as Type CL3 shall be permitted.
(I) Limited Power (LP) Cables.

Limited power (LP) cables shall be listed as suitable for carrying power and data circuits up to a specified current limit for each conductor without exceeding the temperature rating of the cable where the cable is installed in cable bundles in free air or installed within a raceway, cable tray, or cable routing assembly. The cables shall be marked with the suffix “-LP” with the ampere limit located immediately following the suffix LP, where the current limit is in amperes per conductor.

Informational Note: The ampere limit located immediately following the suffix LP is the ampacity of each conductor in a cable. For example, 1 ampere Class 2 limited-power cables would be marked CL2-LP (1.0A), CL2R-LP (1.0A), or CL2-LP (1.0A).

(J) Marking.

Cables shall be marked in accordance with 310.120(A)(2), (A)(3), (A)(4), (A)(5), and Table 725.179(K) Table 725.179(J). Voltage ratings shall not be marked on the cables. Temperature rating shall be marked on the jacket of Class 2 and Class 3 cables that have a temperature rating exceeding 60°C (140°F).

Informational Note: Voltage markings on cables may be misinterpreted to suggest that the cables may be suitable for Class 1 electric light and power applications.

Exception: Voltage markings shall be permitted where the cable has multiple listings and a voltage marking is required for one or more of the listings.

Temperature rating shall be marked on the jacket of Class 2 and Class 3 cables that have a temperature rating exceeding 60°C (140°F).

Table 725.179(J) Cable Marking

<table>
<thead>
<tr>
<th>Cable Marking</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL3P</td>
<td>Class 3 plenum cable</td>
</tr>
<tr>
<td>CL2P</td>
<td>Class 2 plenum cable</td>
</tr>
<tr>
<td>CL3R</td>
<td>Class 3 riser cable</td>
</tr>
<tr>
<td>CL2R</td>
<td>Class 2 riser cable</td>
</tr>
<tr>
<td>PLTC</td>
<td>Power-limited tray cable</td>
</tr>
<tr>
<td>CL3</td>
<td>Class 3 cable</td>
</tr>
<tr>
<td>CL2</td>
<td>Class 2 cable</td>
</tr>
<tr>
<td>CL3X</td>
<td>Class 3 cable, limited use</td>
</tr>
<tr>
<td>CL2X</td>
<td>Class 2 cable, limited use</td>
</tr>
</tbody>
</table>

Informational Note: Class 2 and Class 3 cable types are listed in descending order of fire resistance rating, and Class 3 cables are listed above Class 2 cables because Class 3 cables can substitute for Class 2 cables.

Committee Statement

Committee Statement: Information on limited power cables is being added to the Code.

Response Message:

Statement of Problem and Substantiation for Public Comment

This Public Comment is one of a series on cable heating due to the transmission of power and data using cables that are typically installed in bundles, raceways, cable trays, or cable routing assemblies.

To aid the panel in evaluation this Public Comment, the resolved Public Input 1838 is show at the end of the substantiation. Note: References to other PI’s are omitted.
Where there is an accumulation of cables are used for the transmission of power and data and are in open air or enclosed, the current in the conductors generate heat. The temperature may increase a sufficient amount to cause degradation of the cable insulation. The listing and marking is based on an extensive fact finding investigation by Underwriter's Laboratories. The fact finding report is included for reference.

The UL fact finding investigation shows that the ampacities listed in Table 725.144 are accurate for 4-pair cables without the “-LP” suffix. However, in actual installations the quantity of cables routed together are often greater than 192 cables. The “LP” suffix provides a safety margin for installation in any quantity. In addition, it is important that the current rating of the cable is equal to or less than the nameplate rating of the power source.

Further, 20 AWG was not tested as, presently, 22 AWG is the largest conductor that will fit into a RJ 45 connector. Extensive testing at UL LLC has shown that large bundles of 4-pair cables with 22 AWG or smaller conductors may exceed their temperature rating with all conductors carrying 1 ampere, which is well below the 1.67 ampere maximum current permitted in a 60 volt, 100 VA circuit.

**Affirmative with Comment**
Corbin, Adam D.
I agree.
Stene, Susan L.
LP cables are introduced as an alternative to using conventional cables and the ampacity tables. The “-LP” cable designation indicates that the cable has been evaluated to carry the marked current in any reasonable worst-case installation scenario (bundling) without exceeding the temperature rating of the cable. When used within their ampere ratings and installed in a reasonable manner, using an “-LP” cable provides an alternative that simplifies installation considerations. The testing requirements for the LP certification were developed after extensive testing and research and take advantage of a number of factors which can effectively manage cable heating, such as AWG size, cable design variations and material selection. LP cables provide the opportunity for manufacturers to introduce and utilize new cable technologies and for planners and installers to take advantage of these cable design innovations without compromising safety.

X

**Negative with Comment**
Brewer, Larry G.
Information incomplete no changes necessary
Committee Comment No. 905-NFPA 70-2015 [ Section No. 230.7 ]

This was a Second Revision that has been modified or deleted as the result of Second Correlating Revision: SCR-118-NFPA 70-2016

230.7 Other Conductors in Raceway or Cable.
Conductors other than service conductors shall not be installed in the same service raceway or service cable in which the service conductors are installed.

Exception No. 1: Grounding electrode conductors or supply side bonding jumpers or conductors.

Exception No. 2: Load management control conductors having overcurrent protection shall be permitted within service raceways.

Committee Statement

Committee Statement: The text was revised to meet the Style Manual for complete sentences.

Response Message:
(2) Circulation and Sanitation System, Location.

Receptacles that provide power for water-pump motors or for other loads directly related to the circulation and sanitation system shall be located at least 3.0 m (10 ft) from the inside walls of the pool, or not less than 1.83 m (6 ft) from the inside walls of the pool if they meet all of the following conditions: Consist of single receptacles. These receptacles shall have GFCI protection. Are and be of the grounding type.

Committee Statement

Committee Statement:

Locking type receptacles were previously required to reduce the likelihood of receptacles intended for the sanitation system water pumps being used for other appliances, such as radios and televisions. Receptacles of this configuration were not considered necessary if the receptacle was placed away from the pool a sufficient distance (10 ft.) to keep these appliances outside the reach of persons in the pool.

Recent updates to this section removed the requirement for a locking configuration if the receptacle was at least 6 ft. from the inside walls. This distance was considered sufficient based on the cord lengths of appliances likely to be used around the pool. Based on this analysis the existing text referencing 10 ft. can be removed. The limitation for a single receptacle for the sanitation system pump is also not required based on the same rationale for the 6 ft. limitation. Also the GFCI receptacle devices are usually in a duplex configuration. This list format was no longer needed due to only two conditions being required, which have been compiled into one sentence.

Response Message:

Public Input No. 358-NFPA 70-2014 [Section No. 680.22(A)(2)]

The 2014 NEC removed the rule requiring a twist lock type receptacle for cord and plug connected swimming pool pump motors. It is good that now this can be addressed as it truly is, a receptacle for pump motors and other loads "directly related to the circulation and sanitation systems" of pools. The simple removal of the requirement for the locking configuration receptacle now makes this code section irrelevant. Case in point, article 680.21(B) requires the pool pump motor(s) to be GFCI protected and other code articles already require grounding type receptacles. The twist lock receptacle is the key to this entire code section making any relevance. This 2014 NEC code revision originated because of the 2008 NEC 6 ft. rule change which permitted the required general purpose receptacle to be located at the same point as the pool pump motor receptacle. The argument being one receptacle is twist lock while the other one mounted on the same post 6ft. from the inside walls of the pool is not. The locking configuration type receptacle was removed without considering the overall consequence. By keeping this code section focused on the intent of the rule itself, it becomes more about the circulation and sanitation issue as the code article implies rather then just location. If accepted there should not be a 10 ft. limitation on this locking configuration receptacle requirement. This code section is also not about a required general purpose receptacle. The language in the article 680.22(A)(2) - CIRCULATION AND SANITATION SYSTEM, LOCATION (meaning not closer than 6 ft.) is specific rules for the receptacle installation, and should be regardless of...
where the pool pump motor is located. A pool pump motor with a limited 36 inch maximum cord length per article 680.7 and 680.21(A)(5) connected to a standard blade type receptacle may vibrate from normal use and will dislodge creating arcing, ground fault nuisant tripping and unsanitary unhealthy conditions present. If contractors are concerned about these issues and others (perhaps cost) then they can hardwire the pump motor where permitted. The reason there are no health report status to submit is because the code article enforcement for the locking receptacle(s) has worked over the years. If this rule for no twist lock receptacle is to be left unchanged and unchallenged without regard to public safety then there could be un-sanitary health and safety issues to the public as time will show.

Public Input No. 4351-NFPA 70-2014 [Section No. 680.22(A)(2)]

The single receptacle requirement was relevant when these receptacles had a unique spacing and configuration requirement. The reason for removing the configuration requirement in the 2014 edition was that the unique spacing requirement went away. However, the single device rule was overlooked. There is no more reason to retain it than there is to continue (or resurrect) a special spacing or configuration rule. Note that this rule is not only unnecessary, it adds a degree of difficulty in that a conventional duplex GFCI receptacle cannot be used at this location.

Negative with Comment

Jhonson, Don W.

The Circulation and Sanitation System Equipment Location should be defined. Suggest Equipment shall be located not less than 1.83 m (6 ft) from the inside walls of the pool. The FR defines the receptacle location, this will permit the equipment using a 3-foot cord to be located within 3-feet of the pool wall.

Querry, Dennis Michael

Although the cord for the utilization equipment may only be 6ft in length the equipment could be placed at the edge of a pool within reach of someone inside the pool. The current 10ft requirement would keep the equipment out of reach by a person in the pool.
First Revision No. 4858-NFPA 70-2015 [Section No. 680.23(A)(3)]

(3) GFCI Protection, Lamping, Relamping, and Servicing.

A ground-fault circuit interrupter protection for personnel shall be installed in the branch circuit supplying luminaires operating at more voltages greater than the low-voltage contact limit such that there is no shock hazard during relamping. The installation of the ground-fault circuit interrupter shall be such that there is no shock hazard with any likely fault-condition combination that involves a person in a conductive path from any ungrounded part of the branch circuit or the luminaire to ground.

Committee Statement

Committee Statement: The revisions clarify that the GFCI protection shall be protection for personnel. The addition of "servicing" will close the loophole around replacement of luminaires not technically "lamping" or "relamping", or other types of lighting service. The intent is to get GFCI protection for personnel for all lights operating above the LVCL. The last sentence was deleted as this simply described the function of a properly installed GFCI.

Response Message:

Public Input No. 1471-NFPA 70-2014 [Section No. 680.23(A)(3)]

The National Electrical Code is not a design manual and the requirements in this section should require GFCI protection. The installer should decide how to provide the Ground-Fault Circuit-Interrupter protection for the installation. The GFCI protection in the feeder instead of in the branch circuit does not reduce the safety level of the ground fault protection for the circuit.
**First Revision No. 4862-NFPA 70-2015 [Section No. 680.23(F)(1)]**

(1) **Wiring Methods.**

Branch where branch circuit wiring on the supply side of enclosures and junction boxes connected to conduits run to wet-niche and no-niche luminaires, and the field wiring compartments of dry-niche luminaires, underwater luminaires are subject to physical damage and/or are installed in wet, damp, or corrosive environments, that portion of the branch circuit shall be installed using rigid metal conduit, intermediate metal conduit, liquidtight flexible nonmetallic conduit, rigid polyvinyl chloride conduit, or reinforced thermosetting resin conduit suitable for the location. Where installed on buildings, electrical metallic tubing shall be permitted, and where installed within buildings, electrical nonmetallic tubing, Type MC cable, electrical metallic tubing, or Type AC cable shall be permitted. In all cases, an insulated equipment grounding conductor sized in accordance with Table 250.122, but not less than 12 AWG shall be required.

Exception: Where connecting to transformers for pool lights, liquidtight flexible metal conduit shall be permitted. The length shall not exceed 1.8 m (6 ft) for any one length or exceed 3.0 m (10 ft) in total length used.

**Committee Statement**

Committee Statement: This revised text requires restricted wiring methods only in areas where those harsh conditions are present. Chapter 3 wiring methods are otherwise acceptable. This adds clarity and consistency with other sections within 680.

Response Message:

Public Input No. 3767-NFPA 70-2014 [Section No. 680.23(F)]

The current restrictions in this section related to wiring methods seem to address concerns for two issues; protection from physical damage, and protection from environmental conditions associated with wet, damp, and corrosive conditions associated with pools, spas, hot tubs, etc. The other current text seems to describe portions of those circuits installed in areas not likely to encounter those conditions. Those conditions were likely identified and added one at a time over a span of time. This revision attempts to revise text in a way where the restricted wiring will only apply in areas where those conditions are present and otherwise permit the requirements in Chapter 3 to regulate the wiring.

Negative with Comment

Jhonson, Don W.

The continuous "conductor" equipment ground has been a main stay for safety insuring a maintained equipment ground wire from equipment to service. I agree with the permission of Chapter 3 wiring methods in dry, noncorrosive environments where including a covered, insulated or bare equipment grounding conductor. Allowing Chapter 3 wiring methods without the requirement of a separate conductor for equipment grounding from equipment to service diminishes the safety of the installation.
**First Revision No. 4865-NFPA 70-2015 [ Section No. 680.26(B)(2) ]**

(2) **Perimeter Surfaces.**

The perimeter surface to be bonded shall be considered to extend for 1 m (3 ft) horizontally beyond the inside walls of the pool and shall include unpaved surfaces, as well as poured concrete surfaces and other types of paving. Perimeter surfaces less than 1 m (3 ft) separated from the pool by a permanent wall or building 1.5 m (5 ft) in height or more shall require equipotential bonding only on the pool side of the permanent wall or building. Bonding to perimeter surfaces shall be provided as specified in 680.26(B)(2)(a) or (2)(b) and shall be attached to the pool reinforcing steel or copper conductor grid at a minimum of four (4) points uniformly spaced around the perimeter of the pool. For nonconductive pool shells, bonding at four points shall not be required.

(a) **Structural Reinforcing Steel.** Structural reinforcing steel shall be bonded in accordance with 680.26(B)(1)(a).

(b) **Alternate Means.** Where structural reinforcing steel is not available or is encapsulated in a nonconductive compound, a copper conductor(s) shall be utilized where the following requirements are met:

1. At least one minimum 8 AWG bare solid copper conductor shall be provided.
2. The conductors shall follow the contour of the perimeter surface.
3. Only listed splices shall be permitted.
4. The required conductor shall be 450 mm to 600 mm (18 in. to 24 in.) from the inside walls of the pool.
5. The required conductor shall be secured within or under the perimeter surface 100 mm to 150 mm (4 in. to 6 in.) below the subgrade.

**Committee Statement**

**Committee Statement:** This revision is intended to clarify that the perimeter surface is considered an area rather than a physical object.

**Response Message:**

Public Input No. 1297-NFPA 70-2014 [Section No. 680.26(B)(2)]
As currently written, 3’ is an absolute measurement (35” is a violation, 37” is also a violation). Obviously this isn’t the intent, hence this editorial revision.
680.41  Emergency Switch for Spas and Hot Tubs.

A clearly labeled emergency shutoff or control switch for the purpose of stopping the motor(s) that provides power to the recirculation system and jet system shall be installed at a point readily accessible to the users and not less than 1.5 m (5 ft) away, adjacent to, and within sight of the spa or hot tub. This requirement shall not apply to single one -family dwellings.

Committee Statement

Committee  Changing the word "single"-family to "one"-family will provide a consistent use of the defined term in Article 100

Response Message:

Public Input No. 352-NFPA 70-2014 [Section No. 680.41]
Changing the word "single"-family to "one"-family will provide a consistent use of the defined term in Article 100
680.74 Bonding.

Both metal piping systems and grounded metal parts in contact with the circulating water shall be bonded together using a solid copper bonding jumper, insulated, covered, or bare, not smaller than 8 AWG. The bonding jumper shall be connected to the terminal on the circulating pump motor that is intended for this purpose. The bonding jumper shall not be required to be connected to a double insulated circulating pump motor. The 8 AWG or larger solid copper bonding jumper shall be required for equipotential bonding in the area of the hydromassage bathtub and shall not be required to be extended or attached to any remote panelboard, service equipment, or any electrode. The 8 AWG or larger solid copper bonding jumper shall be long enough to terminate on a replacement non-double-insulated pump motor and shall be terminated to the equipment grounding conductor of the branch circuit of the motor when a double-insulated circulating pump motor is used.

(A) General.

The following parts shall be bonded together:

1. All metal fittings within or attached to the tub structure that are in contact with the circulating water
2. Metal parts of electrical equipment associated with the tub water circulating system, including pump and blower motors
3. Metal-sheathed cables and raceways and metal piping that are within 1.5 m (5 ft) of the inside walls of the tub and not separated from the tub by a permanent barrier
4. All exposed metal surfaces that are within 1.5 m (5 ft) of the inside walls of the tub and not separated from the tub area by a permanent barrier
5. Electrical devices and controls that are not associated with the hydromassage tubs and that are located within 1.5 m (5 ft) from such units

Exception No. 1: Small conductive surfaces not likely to become energized, such as air and water jets, supply valve assemblies, and drain fittings not connected to metallic piping, and towel bars, mirror frames, and similar nonelectrical equipment not connected to metal framing shall not be required to be bonded.

Exception No. 2: Double-insulated motors and blowers shall not be bonded.

(B)

Both metal piping systems and grounded metal parts in contact with the circulating water shall be All metal parts required to be bonded by this section shall be bonded together using a solid copper bonding jumper, insulated, covered, or bare, not smaller than 8 AWG. The bonding jumper(s) shall be connected to the terminal on the circulating pump motor that is intended for this purpose. The bonding jumper shall not be required to be connected to a double insulated circulating pump motor. The 8 AWG or larger solid copper bonding jumper shall be required for equipotential bonding in the area of the hydromassage bathtub and shall not be required to be extended or attached to any remote panelboard, service equipment, or any electrode. The 8 AWG or larger solid copper In all installations a bonding jumper shall be long enough to terminate on a replacement non-double-insulated pump or blower motor shall be provided and shall be terminated to the equipment grounding conductor of the branch circuit of the motor when a double-insulated circulating pump or blower motor is used.
Committee Statement

Committee Statement: The revised text clarifies the intent of the requirement for bonding in the area around hydromassage bathtubs.

Response Message:

Public Input No. 151-NFPA 70-2014 [Section No. 680.74]
The present text literally does not require the hot water and cold water metal pipes supplying the water to the tub, to be bonded since the hot and cold water supply pipes are generally NOT in contact with the circulating water. With the proposed new wording, the metal drain pipe and metal recirculating piping would also still be required to be bonded if it is in contact with the circulating water. This change should help clarify the intent without changing the requirement.

Public Input No. 2129-NFPA 70-2014 [Section No. 680.74]
This change is to clarify the need not to bond small metal parts that is unlikely to become energized while water is circulating through a hydromassage bathtub. This change would only apply to bathtubs supplied by a non-metallic piping system. The rule in Article 680.74 is not about equipotential bonding as with pools, spas or hot tubs although even in Article 680.26(B)(5) there is an implied exception for small metal fittings. Often times the small metal parts such as drains, faucets, fitting, valves, and even manifolds have no where to make a bonding connection except on the fitting or coupling themselves. This is more likely to damage the part then to accomplish any attempt to bond it to the pump motor or equipment grounding conductor.

Negative with Comment

Cook, Donald R.

After review of proposed text, IAEI does not believe revised text clarifies the requirement for bonding around hydromassage bathtubs. Revision expands bonding requirement to devices and controls within 1.5 m (5 ft) with no substantiation for that change. Revision expands bonding requirement to exposed metal surfaces within 1.5 m (5 ft) with no substantiation. While current intent is not perfectly clear, proposed text does not help.
Storable Swimming, Wading, or Immersion Pools; or Storable/Portable Spas and Hot Tubs.

Those swimming, wading, or immersion pools that are intended to be stored when not in use, constructed on or above the ground and are capable of holding water to a maximum depth of 1.0 m (42 in.), or a pool, spa, or hot tub constructed on or above the ground, with nonmetallic, molded polymeric walls or inflatable fabric walls regardless of dimension.

Submitter Information Verification

Submitter Full Name: CMP 17
Organization: Not Specified
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 15 14:15:15 EST 2015

Committee Statement

Committee Statement: The revision clarifies this definition by adding "on or above the ground" which is the basis for the requirements within this article.

Response Message:

Public Input No. 1310-NFPA 70-2014 [Definition: Storable Swimming, Wading, or Immersion Pools; ...]

Ballot Results

This item has passed ballot

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

Affirmative All
Blewitt, Thomas V.
Cook, Donald R.
Hamilton, III, E. P.
Hunter, Randal
Jhonson, Don W.
Krepps, Rachel E.
Querry, Dennis Michael
Sandberg, Chester L.
Schapp, Ronald F.
Yasenchak, Randy J.
Second Revision No. 916-NFPA 70-2015 [Global Comment]

1) Change "ANSI C2-2007" to "ANSI/IEEE C2-2012" in the following places:
   225.1 Informational Note
   225.60(C) Informational Note
   225.61(B) Informational Note
   230.200 Informational Note

2) Change "NETA ATS-2007" to "ANSI/NETA ATS-2013" in 225.56(B) Informational Note.

Committee Statement

Committee Statement: This revision updates references to current editions in several places.

Response Message:

Public Comment No. 126-NFPA 70-2015 [Section No. 230.200]
Referenced correct SDO in the informational note.

Public Comment No. 125-NFPA 70-2015 [Article 225]

Public Comment No. 40-NFPA 70-2015 [Section No. 225.61]
Referenced correct SDO name, and edition.
Second Correlating Revision No. 41-NFPA 70-2016 [Section No. 680.23(F)(1)]

(1) Wiring Methods.
Where branch-circuit wiring on the supply side of enclosures and junction boxes connected to conduits run to underwater luminaires are subject to physical damage and/or are installed in wet, damp, or corrosive environments as described in 680.14, the wiring method of that portion of the branch circuit shall be installed using rigid metal conduit, intermediate metal conduit, as required in 680.14(B) or shall be liquidtight flexible nonmetallic conduit, rigid polyvinyl chloride conduit, or reinforced thermosetting resin conduit suitable for the location. Where installed in dry, noncorrosive environments, branch circuits shall comply with the general requirements in Chapter 3. Wiring methods installed in wet, damp, or corrosive environments as described in 680.14 shall contain an insulated copper equipment grounding conductor sized in accordance with Table 250.122, but not less smaller than 12 AWG shall be required.

Where installed in noncorrosive environments, branch circuits shall comply with the general requirements in Chapter 3.

Exception: Where connecting to transformers or power supplies for pool lights, liquidtight flexible metal conduit shall be permitted. The length shall not exceed 1.8 m (6 ft) for any one length or exceed 3.0 m (10 ft) in total length used.

Committee Statement

Committee Statement: The exception is revised to address comments in balloting and for correlation and clarity.

Committee Comment No. 4828-NFPA 70-2015 [Section No. 680.23(F)(1)]
A modification required due to the creation of 680.14.
680.14 Corrosive Environment.

(A) General.

Areas where pool sanitation chemicals are stored, as well as areas with circulation pumps, automatic chlorinators, filters, open areas under decks adjacent to or abutting the pool structure, and similar locations shall be considered to be a corrosive environment. The air in such areas shall be considered to be laden with acid, chlorine, and bromine vapors, or any combination of acid, chlorine, or bromine vapors, and any liquids or condensation in those areas shall be considered to be laden with acids, chlorine, and bromine vapors, or any combination of acid, chlorine, or bromine vapors.

(B) Wiring Methods.

Wiring methods in the areas described in 680.14(A) shall be listed and identified for use in such areas. Rigid metal conduit, intermediate metal conduit, rigid polyvinyl chloride conduit, and reinforced thermosetting resin conduit shall be considered to be resistant to the corrosive environment specified in 680.14(A).

Committee Statement

Committee Revised to "and similar locations" to be more descriptive and clear. The use of "and/or" is to be avoided as indicated in Annex B of the NEC Style Manual. In (B) the change was made to comply with 90.5 of the NEC.

Committee Comment No. 4817-NFPA 70-2015 [New Section after 680.13]

The topic of suitability to physical damage should be separate text. The reference to specific wiring methods should be deleted from the Article. Wiring methods that have been specifically evaluated for the type of corrosive environment around swimming pool pumps and sanitation chemicals are not as yet readily available. A new Section 680.14 should be created to detail the corrosion resistance necessary of wiring methods needed in swimming pool installations.
(A) General.

The ampacity of service entrance conductors shall have an ampacity of not be smaller than the maximum load to be served. Conductors shall be sized to carry not less than the largest required in of 230.42(A)(1), (A)(2), or (A)(3). Loads shall be determined in accordance with Part III, IV, or V of Article 220, as applicable. Ampacity shall be determined from 310.15. The maximum allowable current of busways shall be that value for which the busway has been listed or labeled.

(1) The service-entrance conductors supply continuous loads or any combination of noncontinuous and continuous loads, the minimum service-entrance conductor size shall have an allowable ampacity not less than the sum of the noncontinuous loads plus 125 percent of continuous loads.

Exception No. 1: Grounded conductors that are not connected to an overcurrent device shall be permitted to be sized at 100 percent of the sum of the continuous and noncontinuous load.

Exception No. 2: The sum of the noncontinuous load and the continuous load if the service-entrance conductors terminate in an overcurrent device where both the overcurrent device and its assembly are listed for operation at 100 percent of their rating shall be permitted.

(2) The sum of the noncontinuous load plus the continuous load minimum service-entrance conductor size shall have an ampacity not less than the maximum load to be served after the application of any adjustment or correction factors.

Committee Statement

Committee Changed “and” to “or” in the last sentence of (A) to indicate that the busway can be listed or labeled since busways are under the jurisdiction of Panel 8.

Statement: The text in (3) was moved to an Exception to correlate requirements with existing text in 215.2 and 210.19 as directed by the Correlating Committee in the CC Note No. 62.

Committee Comment No. 910-NFPA 70-2015 [Section No. 230.42(A)]

The word "or"" was changed to "and" to clarify that equipment that is listed shall also be labeled to assist AHJs in determining whether the equipment is listed during an inspection.

This section was modified to be expressed in a similar fashion to similar requirements found in other parts of the Code.
**Second Correlating Revision No. 67-NFPA 70-2016 [Section No. 210.52(C)]**

<table>
<thead>
<tr>
<th>(C) Countertops and Work Surfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>In kitchens, pantries, breakfast rooms, dining rooms, and similar areas of dwelling units, receptacle outlets for countertop and work surfaces spaces shall be installed in accordance with 210.52(C)(1) through (C)(5).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(1) Wall Countertop and Work Surface Spaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>A receptacle outlet shall be installed at each wall countertop and work surface space that is 300 mm (12 in.) or wider. Receptacle outlets shall be installed so that no point along the wall line is more than 600 mm (24 in.) measured horizontally from a receptacle outlet in that space.</td>
</tr>
<tr>
<td><strong>Exception:</strong> Receptacle outlets shall not be required on a wall directly behind a range, counter-mounted cooking unit, or sink in the installation described in Figure 210.52(C)(1).</td>
</tr>
<tr>
<td>Figure 210.52(C)(1) Determination of Area Behind a Range, or Counter-Mounted Cooking Unit, or Sink.</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>(2) Island Countertop Spaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>At least one receptacle shall be installed at each island countertop space with a long dimension of 600 mm (24 in.) or greater and a short dimension of 300 mm (12 in.) or greater.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(3) Peninsular Countertop Spaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>At least one receptacle outlet shall be installed at each peninsular countertop long dimension space with a long dimension of 600 mm (24 in.) or greater and a short dimension of 300 mm (12 in.) or greater. A peninsular countertop is measured from the connected perpendicular wall.</td>
</tr>
<tr>
<td>A receptacle in a wall countertop space shall be permitted to serve as the receptacle for a peninsular countertop space where the spaces are contiguous and the receptacle is located within 1.8 m (6 ft) of the outside edge of the peninsular countertop.</td>
</tr>
</tbody>
</table>

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<tr>
<th>(4) Separate Spaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Countertop spaces separated by rangetops, refrigerators, or sinks shall be considered as separate countertop spaces in applying the requirements of 210.52(C)(1). If a range, counter-mounted cooking unit, or sink is installed in an island or peninsular countertop and the depth of the countertop behind the range, counter-mounted cooking unit, or sink is less than 300 mm (12 in.), the range, counter-mounted cooking unit, or sink shall be considered to divide the countertop space into two separate countertop spaces. Each separate countertop space shall comply with the applicable requirements in 210.52(C).</td>
</tr>
</tbody>
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<tr>
<th>(5) Receptacle Outlet Location</th>
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<tbody>
<tr>
<td>Receptacle outlets shall be located on or above, but not more than 500 mm (20 in.) above, the countertop or work surface. Receptacle outlet assemblies listed for use in countertops or work surfaces shall be permitted to be installed in countertops or work surfaces. Receptacle outlets rendered not readily accessible by appliances fastened in place, appliance garages, sinks, or rangetops as covered in 210.52(C)(1), Exception, or appliances occupying dedicated space shall not be considered as these required outlets.</td>
</tr>
<tr>
<td><strong>Informational Note:</strong> See 406.5(E) and 406.5(G) for requirements for installation of receptacles in countertops and 406.5(F) and 406.5(G) for requirements for installation of receptacles in work surfaces.</td>
</tr>
</tbody>
</table>
Exception to (5): To comply with the following conditions specified in (1) or (2), receptacle outlets shall be permitted to be mounted not more than 300 mm (12 in.) below the countertop or work surface. Receptacles mounted below a countertop or work surface in accordance with this exception shall not be located where the countertop or work surface extends more than 150 mm (6 in.) beyond its support base.

(1) Construction for the physically impaired

(2) On island and peninsular countertops or work surface where the countertop surface is flat across its entire surface (no backsplashes, dividers, etc.) and there are no means to mount a receptacle within 500 mm (20 in.) above the countertop or work surface, such as an overhead cabinet

Committee Statement

Committee Statement: This action correlates the use of the phrase "work surface" rather than the inconsistent introduction of the term "workspace."

Committee Comment No. 309-NFPA 70-2015 [Section No. 210.52(C)]

The addition of "work surfaces" was made to align with changes in 210.52(A) and to add clarity.

The language in 210.52(C)(3) was modified to not create language that reduces the coverage of receptacles but rather to better define how a peninsular countertop is measured for clarity or when additional receptacles to serve the peninsular countertop space should be provided.
山姆

2009年4月
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r i g h t : 2 e m ; } . C o m m e n t L a b e l * { f o n t w e i g h t : n o r m a l ; }
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2 5 0 ) ; b o r d e r - r a d i u s : 3 p x ; }
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The text in the image is not legible due to the quality of the image. It appears to be a page from a document, possibly containing text in another language, but the content cannot be accurately transcribed.
Second Revision No. 4818-NFPA 70-2015 [ Section No. 680.21(A)(1) ]

(1) General.

Where branch circuits for pool-associated motors are subject to physical damage and/or installed in wet, damp, or corrosive environments, that portion of the branch circuit shall be installed in rigid metal conduit, intermediate metal conduit, rigid polyvinyl chloride conduit, reinforced thermosetting resin conduit, or Type MC cable, suitable for the conditions subject to Wiring methods installed in the corrosive environment described in 680.14 shall comply with 680.14(B) or shall be type MC cable listed and labeled for that location. Wiring methods installed in these locations shall contain an insulated copper equipment grounding conductor sized in accordance with Table 250.122 but not smaller than 12 AWG.

Where installed in dry, noncorrosive environments, branch circuits shall comply with the general requirements in Chapter 3.

Committee Statement

Committee Statement: Wiring methods that have been specifically evaluated for the type of corrosive environment around swimming pool pumps and sanitation chemicals are not as yet readily available. Made revisions to correlate with new Section 680.14. The wiring methods have had acceptable field history in swimming pool installations. The First Draft text referencing resistance to physical damage is not necessary as it applies to all wiring methods.

Response Message:

Public Comment No. 732-NFPA 70-2015 [Section No. 680.21(A)(1)]

This Comment is intended to simplify the Panel's stated goal of simplifying the wiring methods permitted for branch circuits to pool associated motors. However, some serious oversights are corrected in this Comment. For example, all PVC conduit is not identified for protection against physical damage or for all corrosive environments. Only Schedule 80 is suitable for protection against physical damage. PVC conduit in Schedules 40 and 80 are suitable for some but not all corrosive conditions. The manufacturers can and will willingly provide the list of corrosive conditions the PVC conduit is suitable for. Type RTRC conduit is not permitted where subject to physical damage unless identified for such use. This is stated in 355.12(C) under "Uses Not Permitted." Where subject to physical damage unless identified for such use. The UL White Book indicates only RTRC conduit with a suffix "XW" is suitable for protection against physical damage. The term "identified" is defined in Article 100 and is recommended for use in this Section. It means recognized as suitable for the use. Manufacturers, product standards or the NEC in the XXX.10 and XXX.12 sections identify the Uses Permitted and Not Permitted. Furthermore, these wiring methods are required to be listed which provides information to the installer and inspector that the wiring method is suitable for the application.

Affirmative with Comment

Cook, Donald R.

While always supportive of listing and generally supportive of labeling of listed products, it is obvious that many variables impact labeling of different products throughout the NEC. The CC
approach to have a task group review this issue across the NEC is likely the best approach to ensure practical and uniform application of this concept.
Second Revision No. 4819-NFPA 70-2015 [ Section No. 680.22(B)(7) ]


Listed and labeled low-voltage gas-fired electronically ignited luminaires and outdoor luminaire lighting appliances with luminaires, decorative fireplaces, fire pits, and similar equipment using low-voltage igniters that do not require grounding, that do not exceed the low-voltage contact limit, and that and are supplied by listed and labeled transformers or power supplies that comply with 680.23(A)(2) with outputs that do not exceed the low-voltage contact limit shall be permitted to be located less than 1.5 m (5 ft) from the inside walls of the pool. Metallic luminaires and outdoor luminaire lighting appliances shall be bonded in accordance with the requirements in 680.26(B) . Transformers or power supplies supplying this type of equipment shall be installed in accordance with the requirements in 680.24 . Metallic gas piping shall be bonded in accordance with the requirements in 250.104(B) and 680.26(B)(7) .

Committee Statement

Committee Statement: Clarification of the meaning of "outdoor luminated lighting appliances" is required. This type of equipment includes gas-fired fireplaces, fire pits and similar equipment. In addition, clarification is needed that it is the equipment power supply that is "low voltage." The text "and labeled" was added to replicate similar changes made by the Panel.

Response Message:

Public Comment No. 947-NFPA 70-2015 [Section No. 680.22(B)(7)]

Clarification of the meaning of "outdoor luminated lighting appliances" is required. This type of equipment includes gas-fired fireplaces, fire pits and similar equipment. In addition, clarification is needed that it is the equipment power supply that is "low voltage." The text "and labeled" was added to replicate similar changes made by the Panel.

Affirmative with Comment

Cook, Donald R.

While always supportive of listing and generally supportive of labeling of listed products, it is obvious that many variables impact labeling of different products throughout the NEC. The CC approach to have a task group review this issue across the NEC is likely the best approach to ensure practical and uniform application of this concept.

Hamilton, III, E. P.

This is a necessary addition to the Code which is intended to eliminate confusion as to how these devices are addressed.
Second Revision No. 4821-NFPA 70-2015 [ Section No. 680.24(A)(1) ]

(1) Construction.

The junction box shall be listed, labeled, and identified as a swimming pool junction box and shall comply with the following conditions:

1. Be equipped with threaded entries or hubs or a nonmetallic hub
2. Be comprised of copper, brass, suitable plastic, or other approved corrosion-resistant material
3. Be provided with electrical continuity between every connected metal conduit and the grounding terminals by means of copper, brass, or other approved corrosion-resistant metal that is integral with the box

Committee Statement

Committee Statement: The text “listed” alone would allow for listed units that would require the Inspection Authority to search in various databases of the certification agencies while conducting inspection in the field. This is inconvenient and sometimes difficult. The text “and labeled” was added as this would mandate a certification (listing) mark on the product. The additional text “and identified” accurately reflects the Definitions in Chapter 1. It is appropriate in this instance as there are Listed and Labeled equipment readily available that are not intended for swimming pool installations.

Response Message:

Public Comment No. 1303-NFPA 70-2015 [Section No. 680.24(A)(1)]

UL recognizes the Correlating Committee created a global First Correlating Revision (FCR) which directed that in all locations where the term “and labeled” was added after “listed” during the First Revision Stage, the words “and labeled” after “listed” be deleted, returning to previous text. UL understands that the Correlating Committee appointed a task group to address several issues involving the use of the terms “listed” and “labeled,” most importantly, to clarify and establish a distinction between the terms “listed” and “labeled” which are often used interchangeably. UL supports the need for this task group. However, UL does not expect the work of this task group to affect the 2017 NEC regarding the issue of “listed and labeled.” As such, UL is submitting comments to request that the words “and labeled” be added in various locations throughout the Code for the reasons expressed in the public inputs UL submitted on this issue. UL believes that these revisions will address an ongoing problem that should not wait until the 2020 NEC for resolution. Subsequent to the Public Input Code Panel Meetings, UL has discussed this issue with its Electrical Council whose membership includes many AHJs. The proposed revisions to the NEC received general support from the membership. This issue was also discussed at a NEMA – NRTLs Forum held on August 14, 2015 at NEMA Headquarters. UL reiterated its support for the proposed revisions. The NRTLs represented at the meeting voiced no objection to the proposals. The rationale for the revision was simple, to provide information to the AHJ regarding the suitability of equipment they encounter. The mark on the product is the manufacturer’s attestation that the product is in compliance with the appropriate standard. NRTL’s conduct factory surveillance of products, surveillance is one method to validate the manufacturer’s attestation. Should a product be found not to be compliant the manufacturer has the option of removing the mark and shipping the product without the mark, or holding the shipment and bringing the product into compliance. In either case the “Listing” is not impacted, as the “listing” is created at the completion of the “original” certification of the product and indicates the authorization but not the mandate to label.
products. So the only true way an AHJ can determine whether the product he is seeing is compliant with the applicable standard is via a label on the product. Taking it one step further, listings change with time. It is quite possible that a "listing" has been withdrawn; however labeled product may still be available for sale. Should equipment that is labeled, but not listed, be deemed acceptable? Based on the NEC definitions, it is possible to have a product that meets the Article 100 definition of listed but the testing organization made the manufacture remove the label for a non-compliance issue. As for the concerns of products that are too small to be labeled, the definition of labeled is not limited to an actual label, it also includes symbols, or other identifying marks. The Safety Standards which define the listing requirements do not address labeling of products as defined by Article 100. As a general rule, NRTL’s do not consider a product as being listed unless it is also labeled. The UL White Book states that “Only those products bearing the appropriate UL Mark and the company’s name, trade name, trademark or other authorized identification should be considered as being covered by UL’s Certification, Listing, Classification and Follow-Up Service. The UL Mark provides evidence of listing or labeling, which may be required by installation codes or standards.” Again the requirements for the UL Mark are not a Safety Standard requirement, they are a UL requirement and the only way to show that a product is UL Certified (Listed); other NRTL’s have similar requirements.

**Affirmative with Comment**

Cook, Donald R.

While always supportive of listing and generally supportive of labeling of listed products, it is obvious that many variables impact labeling of different products throughout the NEC. The CC approach to have a task group review this issue across the NEC is likely the best approach to ensure practical and uniform application of this concept.
Second Revision No. 4825-NFPA 70-2015 [Section No. 680.43(D)]

(D) Bonding.

The following parts shall be bonded together:

1. All metal fittings within or attached to the spa or hot tub structure.
2. Metal parts of electrical equipment associated with the spa or hot tub water circulating system, including pump motors, unless part of a listed, labeled, and identified self-contained spa or hot tub.
3. Metal raceway and metal piping that are within 1.5 m (5 ft) of the inside walls of the spa or hot tub and that are not separated from the spa or hot tub by a permanent barrier.
4. All metal surfaces that are within 1.5 m (5 ft) of the inside walls of the spa or hot tub and that are not separated from the spa or hot tub area by a permanent barrier.

Exception: Small conductive surfaces not likely to become energized, such as air and water jets and drain fittings, where not connected to metallic piping, towel bars, mirror frames, and similar nonelectrical equipment, shall not be required to be bonded.

5. Electrical devices and controls that are not associated with the spas or hot tubs and that are located less than 1.5 m (5 ft) from such units; otherwise, they shall be bonded to the spa or hot tub system.

Committee Statement

Committee Statement: The text “listed” alone would allow for listed units that would require the Inspection Authority to search in various databases of the certification agencies while conducting inspection in the field. This is inconvenient and sometimes difficult. The text “and labeled” was added as this would mandate a certification (listing) mark on the product. The additional text “and identified” accurately reflects the Definitions in Chapter 1. It is appropriate in this instance as there are Listed and Labeled equipment readily available that are not intended for spa installations.

Response Message:

Public Comment No. 1310-NFPA 70-2015 [Section No. 680.43(D)]

UL recognizes the Correlating Committee created a global First Correlating Revision (FCR) which directed that in all locations where the term “and labeled” was added after “listed” during the First Revision Stage, the words “and labeled” after “listed” be deleted, returning to previous text. UL understands that the Correlating Committee appointed a task group to address several issues involving the use of the terms “listed” and “labeled,” most importantly, to clarify and establish a distinction between the terms “listed” and “labeled” which are often used interchangeably. UL supports the need for this task group. However, UL does not expect the work of this task group to affect the 2017 NEC regarding the issue of “listed and labeled.” As such, UL is submitting comments to request that the words “and labeled” be added in various locations throughout the Code for the reasons expressed in the public inputs UL submitted on this issue. UL believes that these revisions will address an ongoing problem that should not wait until the 2020 NEC for resolution. Subsequent to the Public Input Code Panel Meetings, UL has discussed this issue with its Electrical Council whose membership includes many AHJs. The proposed revisions to the NEC received general support from the membership. This
issue was also discussed at a NEMA – NRTLs Forum held on August 14, 2015 at NEMA Headquarters. UL reiterated its support for the proposed revisions. The NRTLs represented at the meeting voiced no objection to the proposals. The rationale for the revision was simple, to provide information to the AHJ regarding the suitability of equipment they encounter. The mark on the product is the manufacturer’s attestation that the product is in compliance with the appropriate standard. NRTL’s conduct factory surveillance of products, surveillance is one method to validate the manufacturer’s attestation. Should a product be found not to be compliant the manufacturer has the option of removing the mark and shipping the product without the mark, or holding the shipment and bringing the product into compliance. In either case the “Listing” is not impacted, as the “listing” is created at the completion of the “original” certification of the product and indicates the authorization but not the mandate to label products. So the only true way an AHJ can determine whether the product he is seeing is compliant with the applicable standard is via a label on the product. Taking it one step further, listings change with time. It is quite possible that a “listing” has been withdrawn; however labeled product may still be available for sale. Should equipment that is labeled, but not listed, be deemed acceptable? Based on the NEC definitions, it is possible to have a product that meets the Article 100 definition of listed but the testing organization made the manufacture remove the label for a non-compliance issue. As for the concerns of products that are too small to be labeled, the definition of labeled is not limited to an actual label, it also includes symbols, or other identifying marks. The Safety Standards which define the listing requirements do not address labeling of products as defined by Article 100. As a general rule, NRTL’s do not consider a product as being listed unless it is also labeled. The UL White Book states that “Only those products bearing the appropriate UL Mark and the company’s name, trade name, trademark or other authorized identification should be considered as being covered by UL’s Certification, Listing, Classification and Follow-Up Service. The UL Mark provides evidence of listing or labeling, which may be required by installation codes or standards.” Again the requirements for the UL Mark are not a Safety Standard requirement, they are a UL requirement and the only way to show that a product is UL Certified (Listed); other NRTL’s have similar requirements.

**Affirmative with Comment**

Cook, Donald R.

While always supportive of listing and generally supportive of labeling of listed products, it is obvious that many variables impact labeling of different products throughout the NEC. The CC approach to have a task group review this issue across the NEC is likely the best approach to ensure practical and uniform application of this concept.
(A) Feeders.

Where feeders are subject to physical damage and/or installed in wet, damp, or corrosive environments as described in 680.14, the wiring method of that portion of the feeder shall be installed in rigid metal conduit, intermediate metal conduit, rigid polyvinyl chloride conduit, or reinforced thermosetting resin conduit, suitable for the conditions. Where installed in dry, noncorrosive environments, feeders shall comply with the general requirements in Chapter 3 as required in 680.14(B) or shall be liquidtight flexible nonmetallic conduit. Wiring methods installed in wet, damp, or corrosive environments as described in 680.14 shall contain an insulated copper equipment grounding conductor sized in accordance with Table 250.122, but not less smaller than 12 AWG shall be required.

Where installed in noncorrosive environments, feeders shall comply with the general requirements in Chapter 3.

Committee Statement

Committee Statement: A modification required due to the creation of 680.14.

Response Message:

Public Comment No. 731-NFPA 70-2015 [Section No. 680.25(1)]

This Comment is intended to simplify the Panel's stated goal of simplifying the wiring methods permitted for feeders. However, some serious oversights are corrected in this Comment. For example, all PVC conduit is not identified for protection against physical damage or for all corrosive environments. Only Schedule 80 is suitable for protection against physical damage. PVC conduit in Schedules 40 and 80 are suitable for some but not all corrosive conditions. The manufacturers can and will willingly provide the list of corrosive conditions the PVC conduit is suitable for. Type RTRC conduit is not permitted where subject to physical damage unless identified for such use. This is stated in 355.12(C) under "Uses Not Permitted." Where subject to physical damage unless identified for such use. The UL White Book indicates only RTRC conduit with a suffix "XW" is suitable for protection against physical damage. The word "less" is replaced with "smaller" because "less" refers to quantity and "smaller" refers to the size which is the subject of the size of the equipment grounding conductor. The ending phrase "shall be required" is repetitive of the requirement earlier in the sentence as thus is shown being deleted.
Second Correlating Revision No. 59-NFPA 70-2016 [Section No. 230.42(A)]

(A) General.

The ampacity of service entrance conductors shall have an ampacity of not be smaller less than the maximum load to be served. Conductors shall be sized to carry not less than the largest required in 230.42(A)(1), or (A)(2), or (A)(3). Loads shall be determined in accordance with Part III, IV, or V of Article 220, as applicable. Ampacity shall be determined from 310.15. The maximum allowable current of busways shall be that value for which the busway has been listed or labeled.

(1) The Where the service-entrance conductors supply continuous loads or any combination of noncontinuous and continuous loads, the minimum service-entrance conductor size shall have an allowable ampacity not less than the sum of the noncontinuous loads plus 125 percent of continuous loads.

Exception No. 1: Grounded conductors that are not connected to an overcurrent device shall be permitted to be sized at 100 percent of the sum of the continuous and noncontinuous load.

Exception No. 2: The sum of the noncontinuous load and the continuous load if the service-entrance conductors terminate in an overcurrent device where both the overcurrent device and its assembly are listed for operation at 100 percent of their rating shall be permitted.

(2) The sum of the noncontinuous load plus the continuous load minimum service-entrance conductor size shall have an ampacity not less than the maximum load to be served after the application of any adjustment or correction factors.

Committee Statement

Committee Statement: Changed “and” to “or” in the last sentence of (A) to indicate that the busway can be listed or labeled since busways are under the jurisdiction of Panel 8.

The text in (3) was moved to an Exception to correlate requirements with existing text in 215.2 and 210.19 as directed by the Correlating Committee in the CC Note No. 62.

Committee Comment No. 910-NFPA 70-2015 [Section No. 230.42(A)]

Committee Comment: The word "or" was changed to "and" to clarify that equipment that is listed shall also be labeled to assist AHJs in determining whether the equipment is listed during an inspection.

This section was modified to be expressed in a similar fashion to similar requirements found in other parts of the Code.